No. 94,034.

CURTIS & BLAISDELL'S COAL POCKETS.

For arrangement of Coal Handling Machinery, see Cut No. 93,048.

No. 9306.

COAL HANDLING MACHINERY,

DESIGNED AND MANUFACTURED BY

C. W. HUNT COMPANY,

NEW YORK.

THIS VOLUME CONTAINS THE PRINCIPAL PARTS OF OUR CATALOGUE ON

AUTOMATIC RAILWAYS,
COAL ELEVATORS,
STEAM SHOVELS,
CABLE RAILWAYS,
HOISTING ENGINES,
COAL TUBS,
WHEEL BARROWS,
COAL SCREENS,
ROPE BLOCKS.

Conveyors, Industrial Railways, and Manila Transmission and Hoisting Rope are not included here, but are described in separate Catalogues.

C. W. HUNT COMPANY,

OFFICE: 45 BROADWAY, NEW YORK.

Cable Address: "COALSHOVEL, NEW YORK." Telegraph Codes: "A B C," Fourth Edition, and "A 1."

CHICAGO OFFICE: 315 DEARBORN STREET, CHICAGO, ILL.

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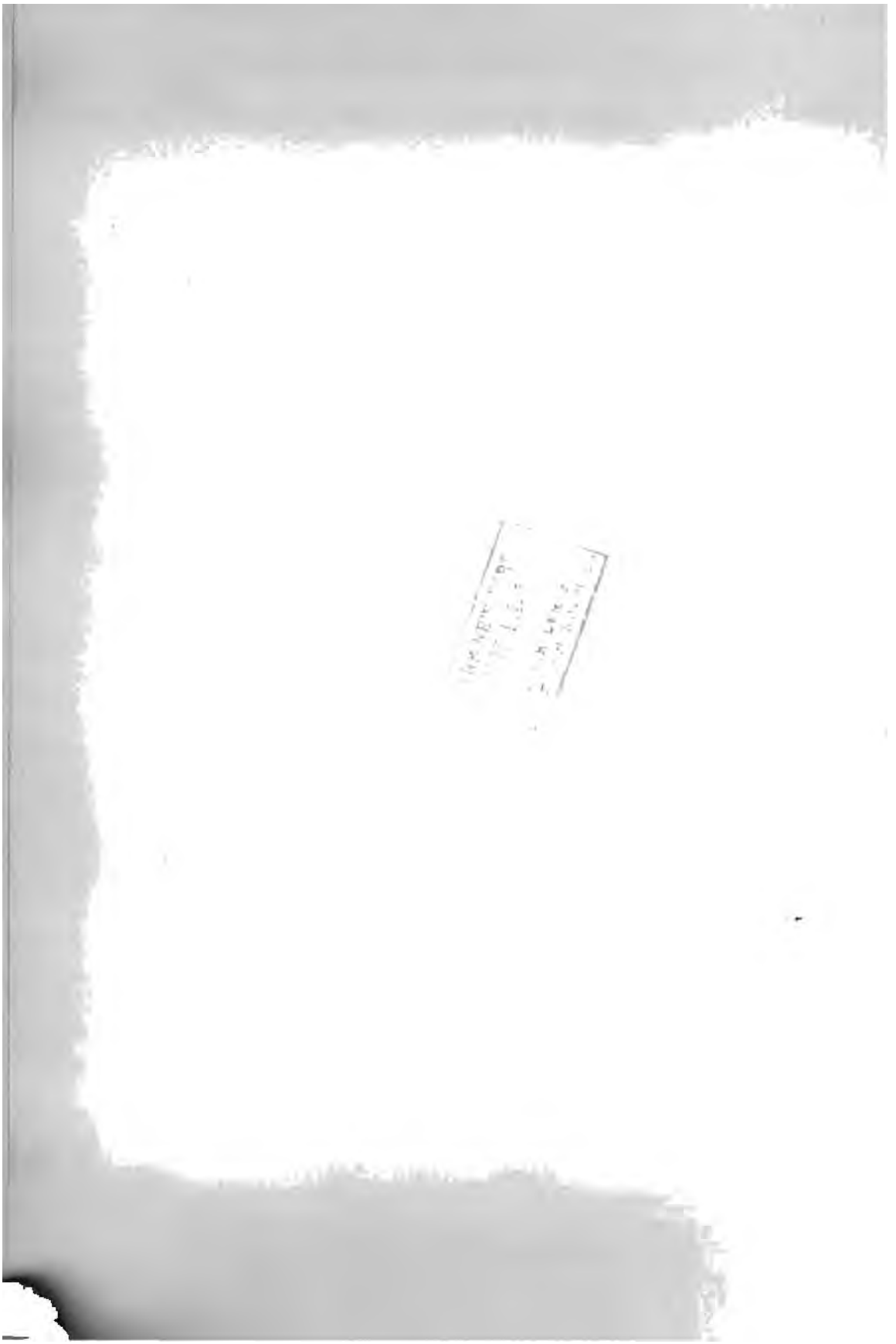
Press of A. H. Kellogg, Scott & Bowie Building, New York.

No. 94,035.

J. STEPHENS & SON'S COAL YARD,

New York City.



INTRODUCTION.

BUSINESS men must elect what class of customers to deal with. We seek that class of purchasers who wish articles built thoroughly well, and which have every part carefully made from the best materials, and who are willing to pay whatever amount may be necessary to obtain such articles. For this reason we give no anxious thought as to whether this or that can be made a little cheaper, but have the materials and workmanship just as thoroughly good as possible, the sole criterion being whether the article will be better adapted for its work or more durable in use. We do not care to sell any machine that is not as good in every respect as though the purchaser himself had selected the materials, and personally supervised its construction in our factory.

Our customers are entirely those who use and wear out the articles they purchase; consequently, quality takes precedence of cost with them. Having no trade with middlemen, and paying no commissions, there is no temptation to reduce the quality of articles to compete with those who seek that class of business.

Possibly some readers may have the idea that the improvements made in this class of machinery have first been a happy thought put into the form of a drawing or model, and that then the inventor has sought, in some class of business, a customer who would adopt the device and put it into use. The machinery built by the C. W. HUNT COMPANY had a widely different origin. Every improvement has been devised to meet a definite want of a customer, and not invented first and a place to use it found afterwards. This wholly eliminates experimental machinery; a real want is met, instead of an inventor's idea of what somebody ought to want.

It is a common idea that because coal is heavy and dusty, coal machinery is rough and coarse. This is a wholly mistaken belief. No Waltham watch or Baldwin locomotive is more carefully designed, the details more thoroughly studied, or the materials more carefully selected and worked into shape, than are the working parts of the Shovel, Elevator, and Automatic Railway. It may seem at first sight to be a useless refinement to work to templets, turning shafts to vary less than one-thousandth of an inch, making taper fits and other refinements of modern mechanism, on machinery to be roughly handled, covered with grease and dust, and exposed to every storm, but it is a positive economy. Durability and freedom from delays justify this painstaking care and expense.

We design and furnish of our own make machinery for unloading vessels or railway cars, and storing coal, ore, gypsum, and similar materials. We also make the tracks, switches, crossings, and complete equipment for a system of light railways for any industrial purpose. Every part of this is built precisely as we make all other machinery—that is, thoroughly good. We have been in this special line of business since 1872, and our coal handling machinery is in use in almost every port of America. We have ample shops and tools, and manufacture our own machinery, and thus have a control over both the quality and workmanship that otherwise we could not have. We also design and make plans for all classes of wharves, trestles, and storage buildings for storing coal and ore, and similar materials.

Orders received by mail will be shipped with the same promptness and fidelity as though they were given in person. It will make no difference whatever in the prices, as just as low a price will be made to parties by correspondence as though they personally visited our works. We assume that purchasers desire to pay us a reasonable price for the cost of material and labor with a reasonable profit; more than this we do not wish, and less than this we will not take.

We shall be glad to receive plans and descriptions of proposed plants from parties desiring to make improvements, to which it will give us pleasure to reply, giving such information as it is in our power to do.

MODERN MACHINERY.

No. 1410.

Hunt Automatic Machinery unloading a "Whaleback."

A BRIEF HISTORY

OF

COAL HANDLING MACHINERY.

THE tendency of machinery for unloading vessels and for handling coal, iron ore and similar materials, has been towards more rapid work, and at a less expense per ton, necessarily requiring machinery that is heavier, more complex, and more expensive. The change from doing the work almost entirely by hand, to the present method of doing the work wholly by machinery, has been a gradual one. The first method required a great amount of hard physical labor. The present method requires but little exertion on the part of workmen, but requires more skill, entails greater responsibility, and a higher rate of wages per day. It will give a clearer idea of the changes in the method of handling, to follow the gradual improvements that have been made.

No. 136.
Unloading Vessels in the West India Ports.

The primitive method of unloading coal from vessels was for the workmen to carry it ashore in baskets on their heads. This method is still in general use in the ports of India, Africa, the West Indies and South America. From 50 to 150 men and women work together, and take out from three to four tons per day to each person employed. The wages paid are only a few cents per day, and the laborers are at about the lowest point in the scale of civilization.

An improvement on this method is the one now in general use at New Orleans, and other lower Mississippi ports. The coal is shoveled directly into the wheelbarrows, and wheeled ashore on temporary plank runs. Eighteen wheelers, with a water carrier and an

ARCHAIC METHODS.

No. 93043.

Steamer unloading a cargo of coal in the West Indies.

C. W. HUNT COMPANY, NEW YORK.

axe man, make a gang; there being two gangs to each boat, making a total of about forty men Each man takes out on an average about six tons of coal per day.

No. 118.
Unloading Coal at New Orleans.

No. 111.
Coal Handling in Cincinnati, Ohio.

At Cincinnati, Louisville and St. Louis the coal is shoveled into cars instead of wheelbarrows, which is an improvement upon the lower Mississippi methods, but yet is very laborious and expensive.

Another improvement was made by erecting a mast and gaff, using half-barrels as tubs and hoisting the coal with a horse, and dumping it into a cart, or into wheelbarrows on an elevated run. This saved wheeling the coal up hill or throwing it a great distance into cars. With this method there were employed two shovelers, one man to lead the horse, and from four to six men for dumping and wheeling, making a total of seven to nine men employed.

No. 126.
Mast and Gaff for Coal Hoisting in New York.

No. 1117.
Wheeling Coal.

The daily output was about ten tons per day for each man employed. It will be noticed that the workman on the cart has reached the point in civilization of wearing a Derby hat.

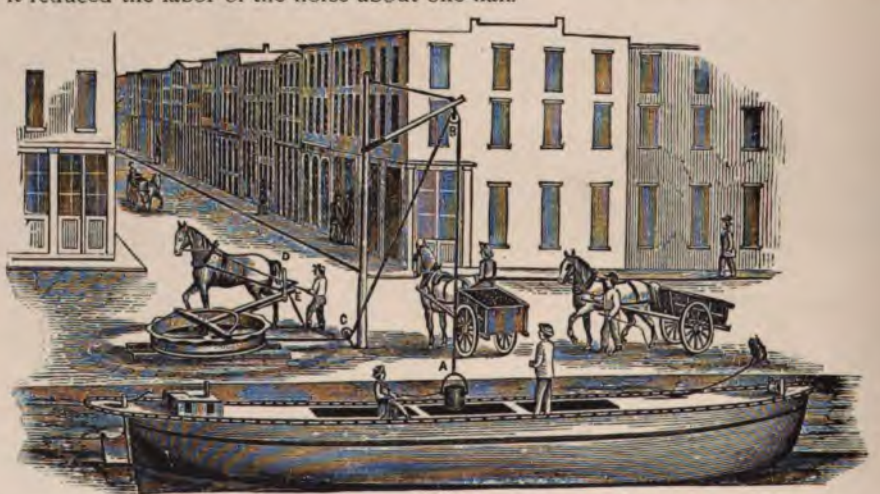
Another improvement was made in 1857 by Mr. George Focht, whose business integrity and firmness of character made him widely know among users of this kind of machinery. Instead of the round wooden tub, he devised a peculiarly shaped and balanced iron tub, which is now in almost universal use. This tub is top heavy when filled, and bottom heavy when empty, consequently it is self-dumping and self-righting. It is also formed so that it is much easier to fill than a round tub. This did not reduce the number of men, but increased their efficiency, and made the daily output about twelve tons for each man employed.

No. 1023.—Rear view of Coal Tub.

No. 1146.— Modern Coal Tub.

No. 1136.—Tub Hook for single whip hoisting.

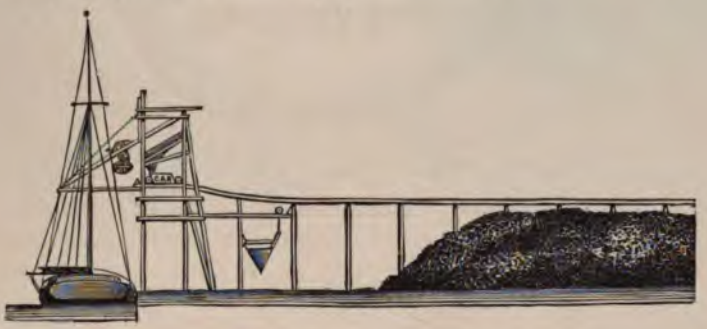
An improvement made by Mr. P. K. Dederick, of Albany, N. Y., was a horse-hoisting machine that very materially reduced the labor of the horse in hoisting. Previous to this, the horse walked forward to hoist a full bucket, and was obliged to back to lower the empty bucket into the hold of the vessel. With most horses, this latter was harder work than hoisting the loaded bucket, while the Dederick machine increased the speed of unloading but little, it reduced the labor of the horse about one-half.



No. 1163.— Hoisting Coal from Canal Boats with Dederick Machines.

The next decided step in advance was the introduction of The Hunt Automatic Railway. This Railway is operated entirely by gravity, needing neither steam, horse nor manual power. The car runs down the track, dumps its load and returns to the loading place automatically.

The workman does not accompany the car, and has ample time while the car is making the trip to weigh the coal and enter it in his weight-book. With one man only, the coal can be weighed and stored in any desired bin within 500 or 600 feet of the vessel. As the carrying capacity of this car is over sixty tons per hour, the number of shovelers in the hold of the vessel was increased to three, and the coal was hoisted by a small steam engine. The output now was about fifteen tons per hour, or 150 tons per day, with a total of five men employed: three shovelers, one hoister and one attending the automatic car, or an average of about twenty-five to thirty tons per day for each man employed.



No. 2.—Coal Storage Plant, Elevator and Automatic Railway.

The increase in the speed of handling by the use of the steam engine and the automatic car, made the swinging of the bucket, as it came out of the hold, whether using an ordinary gaff or hoisting from a sling from the mast head, very objectionable. This was overcome by the use of the "Hunt Elevator," which had inclined booms running out over the vessel, the bucket being hoisted vertically until it reached the booms, and then guided by a track up the booms

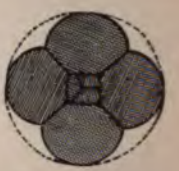
No. 122.—H. L. Herbert & Co Coal Yard, foot 29th St., E. R., N.Y. Steam Shovel Elevator, Automatic Railways and Coal Pockets.

No. 106.—Pennsylvania Coal Co., Milwaukee, Wis. Four Movable Elevators

increased from four to six men. The output per day with this machine was about thirty-five or forty tons per day for each man employed. This increase of weight in the buckets, and the increase in speed, caused a rapid wear of the hoisting rope. Attempts to use wire rope were generally unsuccessful, principally because the workmen would frequently hook on a bucket that was standing ten or fifteen feet from the hatch. The engine would

in this case draw the wire rope around the sharp corner of the hatch coamings; this would injure the rope, and it was this injury, instead of the legitimate wear that was most troublesome and destructive. Manila hoisting rope of the best quality could not always be procured; the users purchasing from ship chandlers, who usually only keep ordinary

Cross Section of Three Strand Rope.
No. 1057



Cross Section of Four Strand Rope.
No. 1058

No. 1028.—Hunt's Patent Four Strand Manila Hoisting Rope.

commercial rope. We made a careful investigation of the causes of the wear of rope, an abstract of which will be found in our detailed description of ropes of our manufacture. We then had manufactured, under our patent, a rope of the very finest quality of manila, laid up with the purest plumbago, and with sufficient tallow to hold it in position. The plumbago, obviated the internal wear, and the durability of the rope was increased two or three times that of ordinary rope used for hoisting purposes.

The sheaves over which the rope ran, having a heavier load and running more rapidly, caused trouble, and we then made the improvements in the bearings of these sheaves, which are found described in detail elsewhere.

No. 1052.—Hunt's Ball or universal joint for dock blocks.

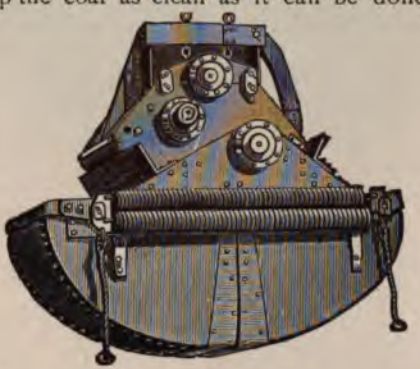
No. 1015.—Hunt's Hoisting Blocks for manila rope.

No. 91.—Hunt's patent roller bearing.

Shoveling coal is not only very hard work, but requires considerable skill. Owing to the intermittent character of the work, the wages paid are far above the ordinary price, for other labor and in most of the large coal handling centres "Coal Shovelers' Unions" were formed that arbitrarily fixed the price for shoveling coal, which varies for the shoveling alone from eight to sixteen cents per ton at different ports. The wages received at these prices were from $4 to $8 per day for each workman.

To reduce this expense, and at the same time to increase the daily output, we devised our Steam Shovel, which fills itself when lowered on the coal, and carries from one to one and a half tons to a load. It is entirely automatic both in filling and in dumping, so that no one is required on the vessel in any way, except towards the last to scrape the coal out of the corners. It picks up the coal as clean as it can be done by

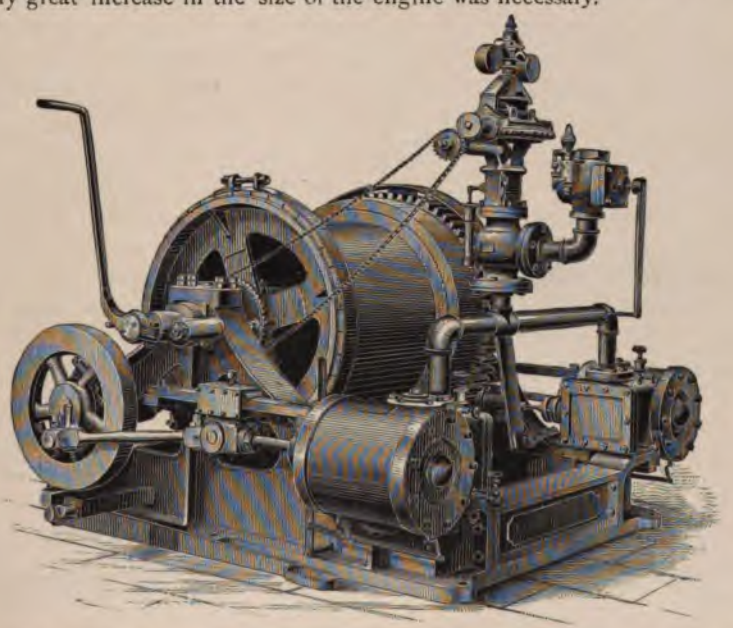
No. 19.



No. 20.

Hunt's Steam Shovel for Coal Handling.

a man shoveling, does not injure the ceiling of the vessel in the least, and breaks the coal far less than hand shoveling. Usually one man is put on the vessel to attend the lines, and move the vessel to position from time to time as the coal is taken out, and towards the last to gather up the scattered coal. As this shovel and its load weigh about six thousand pounds, a very great increase in the size of the engine was necessary.



No. 1127.—Hunt's Rapid Hoisting Engine—75-horse power, with variable governor for steam shovel.

With these powerful engines it required considerable skill on the part of the engineer to handle the throttle in hoisting. It was necessary for the bucket to be started slowly from the

hold of the vessel, the engine running at a moderate speed until it cleared the coaming of the hatches, then hoisted at the highest speed until it approached the projecting booms of the elevator, where it was then slowed up to a moderate speed, then run fast up the booms and stopped at the dumping point. To do this with rapidity and certainty at all times requires an amount of skill that it is sometimes difficult to obtain. To obviate this we have attached to our engines a governor arranged in a very peculiar manner. The governor is driven from

No. 1135.

No. 1133.

Hunt's Governor for automatically changing the speed of the engine.

the drum upon which the chain winds, and not from the shaft of the engine, and is arranged in such a manner that the speed can be automatically varied so as to make the different changes of speed entirely independent of the throttle valve, or the engineer. The engineer in hoisting throws the throttle valve wide open, the governor regulating the speed of the engine, fast or slow, at the different points, and with unerring certainty.

This shovel carries over a ton of coal at each trip, and will make a round trip in about forty-five seconds, which makes a theoretical amount of one hundred tons hoisted per hour, but the average speed of unloading in discharging cargoes is from fifty to seventy tons per hour at each hatch, with one man on the vessel, one at the engine to hoist and one to attend the automatic car, making a total of three men who take out from five hundred to seven hundred tons per day, or from one hundred and sixty to two hundred and thirty tons per day for each man employed at the work; thus the efficiency of one man's work has been increased, by the use of modern machinery, from three to over two hun-

No. 128.—Automatic machinery with bridge 300 feet span especially adapted to iron ore handling. The Elevator and bridge are movable along the entire length of the wharf.

dred tons per day of ten hours, or in the proportion of about seventy to one, and the increase since 1873, when our Mr. Hunt began the introduction of our automatic

machinery, has been about TWENTY TO ONE, and at the same time the physical exertion of the laborer is much less severe, and the wages paid to the workmen per day nearly fifty per cent. greater.

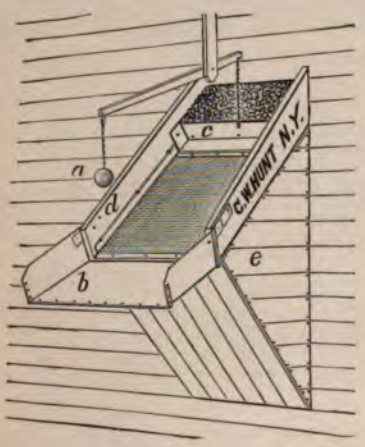
Notwithstanding this increase in the price paid to the workmen, the whole labor expense of taking coal out of a vessel, hoisting it from thirty to ninety feet, weighing it and running it back from two hundred to three hundred feet and storing it in elevated bins or pockets ready to draw into carts, in no case exceeds three cents per ton, and has been reduced in some cases to one and one-tenth cent per ton in regular work.

Formerly, the coal was piled on the ground and exposed to the weather; As the business increased coal sheds were built to protect it from snow and rain. The enormous expansion of the trade required some of these buildings to be very large, and the loss of

No. 113.—3000 ton Coal Pocket with Hunt's Automatic Machinery.

No. 79.—Coal Building, with Hunt's Patent Tunnel.

time in loading teams, and the great delay while waiting for each other, where a large number were employed, led to the erection of what are usually called "coal pockets," or buildings for holding coal, that are elevated one story, the teams driving beneath the floor on which the coal rests and loading the coal into carts or wagons by drawing it through chutes.



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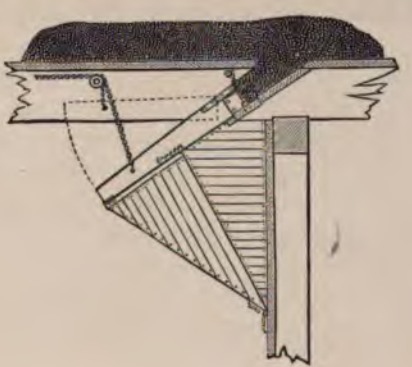


No. 1007.

Coal Chute with Briggs Valve and removable Screen.

The very great strength required in these buildings that must sustain many thousand tons, led to the construction of buildings requiring an especial engineering training and experience. In the engravings will be found many examples, for the most of which we made the general and detailed drawings.

As it is necessary to screen anthracite coal, a somewhat peculiar valve and screen is used, especially adapted for use in these pockets. This permits coal to be loaded into the wagons, and screened very much more carefully that it is practical to do by hand.

Of the great number of valves and chutes devised for Anthracite Coal, that invented by Mr. J. N. Briggs, of Albany, is the simplest and most efficient. It has the great advantage that a large piece of coal will go through it as easily as a small piece, and it can never get obstructed. For convenience they are made with removable screens of various sizes so that the coal can be thoroughly screened, and run into the cart with hand labor, the screenings being run into a separate bin.

The automatic railway answers the purpose of conveying coal for distances of 600 feet or less, but beyond that a different method is necessary. For this purpose a cable railway is used in which the cars are drawn by a wire cable running the whole length of the track and driven by power. These tracks can be built any length from a few hundred to several thousand feet. The longer tracks have the cable running constantly to which the cars are fastened as soon as loaded and run to the dumping place where the load is automatically dumped, the car passing on over a loop and returning to the loading point.

No. 1290.—Cable Railway in Orient Guano Works, Orient, N. Y.

The cost of handling material by this railway is very small—the distance having very little to do with the expense—as the workmen do not accompany them—the cost being principally in loading the cars. They run the whole length of the track and dump automatically wherever set and return to the loading place, thus reducing the cost of carrying the coal to the expense of loading the cars and the cost of power to drive the cable.

The railway can be level or on a grade either up or down and around whatever curves may be necessary to accomplish the purpose. The only difference in the working of a track with heavy grades is that it requires a greater power in the engine to drive the cable. The daily expense of operation is the same as a level railway.

A belt or chain with buckets attached for moving materials answers the purpose in many circumstances better than any other method. For this purpose we use a conveyor, which is a chain having very long links carried on wheels and with large buckets for carrying the material. This chain runs very slow, the capacity being obtained by the size

of the buckets and not by the speed of the chain. As these buckets are pivoted in the chain they are kept upright by gravity, consequently the chain can be run horizontally, perpindicular or at any angle without affecting the working of the buckets.

It will be seen that a complete apparatus for coal handling is a very expensive affair, but this large expense is justified by the great speed and the low cost per ton at which the coal can be handled. The expense of unloading a ton of coal from a vessel in most of our

No. 95.—Milwaukee Gas Light Co., Coal wharf. 3 Elevators, movable on top of the building.

seaports has been, by the usual method employed by stevedores, twenty-five cents per ton for shoveling and hoisting, about three cents per ton for wheeling, to which must be added a charge for the expense of screening and loading into carts, making a total expense of from thirty to forty cents per ton, and in many parts of the country a higher price is paid.

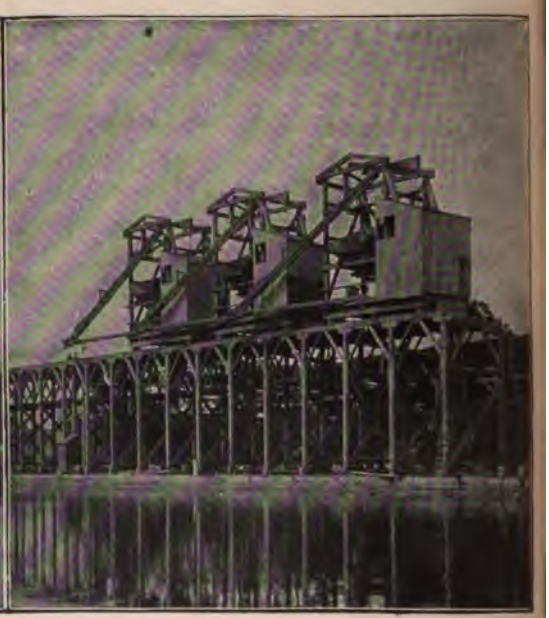
The same work of taking from a vessel, hoisting, weighing and running back and storing in coal pockets ready to draw by gravity into carts, in many yards using our machinery, does not exceed *three cents per ton*, only one-thirteenth the cost of the previous method of working. The difference in the expense of handling coal for one year by the two methods, after making an allowance for fuel, oil and for interest and depreciation on the plant would be a large sum. This great saving will justify a large expenditure for machinery, and

No. 96.—Lehigh Coal & Iron Co., West Superior, Wis. Fitted with Hunt Machinery, * wharf 2000 ft. long 300 ft. wide. Nine Elevators and 75 Automatic Railways—Capacity for unloading from vessels, 7000 tons per day.

* When docks have a long water front, the Elevators are set on wheels running on a track along the water front, or on the side and top of the building. The engine is placed in the Elevator, and the whole affair moved to any part of the wharf required. In this way only as many Elevators are built as may be needed to unload at the requisite speed ; yet a very long dock can be fully utilized

No. 94.

Coal Handling Machinery in Milwaukee, Wis H. M. Benjamin, Pennsylvania Coal Co., and R. P. Elmore Co.



No. 99. No. 100.

No. 99.—New York Gas Light Co. Two Elevators and Automatic Railways.
No. 100.—R. P. Elmore & Co., Milwaukee, Wis. Three Elevators and Automatic Railways.

any false economy in the size, capacity or perfection of the machinery will be the poorest kind of business judgment.

The time has passed when a coal dealer can in any of our cities permanently do business on a small capital, or with cheap fixtures. Harsh as it may seem, it is unquestionably true that such a one must sooner or later retire from the business and leave the field to those who are thoroughly equipped to work rapidly and cheaply.

THE FOLLOWING TABLE SHOWS THE COMPARATIVE COST OF COAL HANDLING IN VARIOUS PORTS, AND THE SAVING THAT IS MADE BY THOSE USEING THE MOST IMPROVED MACHINERY.

1889.	New York.	Boston.	Milwaukee and Lake Ports.
Regular price charged by stevedores for shoveling and hoisting one ton of coal from the vessels	15 cts.	25 cts.	35 cts.
Wheeling to bin, average distance	2 cts.	2 cts.	4 cts.
Screening from the stock pile and loading into carts or wagons	6 cts.	7 cts.	6 cts.
Allowance for loss of time of the team while waiting to be loaded by hand labor	10 cts.	12 cts.	10 cts.
Total cost of handling the coal from the hold of the vessel to the delivery wagon	33 cts.	46 cts.	55 cts.
The cost shown by experience, of doing the same work by our AUTOMATIC MACHINERY, such as shown in engravings Nos. 83, 84, 85, 86, 87, 94, 95, 96, 99, 100, 101, 103, 105, 106, 110, 113, 116, and 122, would not exceed on the most suitable vessel	2 cts.	3 cts.	3 cts.
The cost on such vessels as can now be chartered without trouble	2½ cts.	4 cts.	6 cts.
Difference between stevedore charges and the cost with AUTOMATIC MACHINERY	from 30½ to 31 cts.	from 42 to 43 cts.	from 49 to 52 cts.

A dealer handling forty thousand tons of coal per annum by using the Hunt machinery would save at New York prices $12,000, at Boston prices $17,000 and at lake port prices $20,000 a year.

Omitting all the advantages which this machinery gives in the rapid discharging of vessels, the saving in wharf room to do the same business, the less number of horses, wagons and stable room to be provided, the freedom from strikes of laborers, and the more perfect screening of coal sent out, the annual saving to a dealer handling forty thousand tons would justify an expenditure for machinery and storage pockets: New York, $80,000, Boston, $123,000, lake ports $133,000, estimated on the basis of six per cent. interest for the money, and a deduction of ten per cent. for wear and tear, which will permit a total renewal of every part of the investment every ten years.

The different parts of this machinery are described elsewhere, together with many modifications it is advisable to make in peculiar situations to suit the different materials, and the amount of work to be done. A small yard handling but two or three thousand tons per year would not be justified in making so large an expenditure as the most perfect machinery would entail. In such cases they can use parts of it that will make the greatest saving for a justifiable expenditure.

No. 122.

No. 105.

No. 122.—H. L. Herbert & Co., Coal Yard, 20th St., E. R., N. Y. Steam Shovel, Elevator, Automatic Railway and Coal Pockets.
No. 105.—Lysle Crow & Co., North Bend, Ohio. Steam Shovel plant on a float.

No. 125.

No. 140.

No. 125.—Hencken & Co., foot of E. 4th St., NewYork. Steam Shovel, Elevator, Automatic Railway, 675 ft. long and Coal Pockets.
No. 140.—J. J. Poole & Co., Hartford, Conn. Steam Shovel, Elevator, Automatic Railways and Coal Pockets.

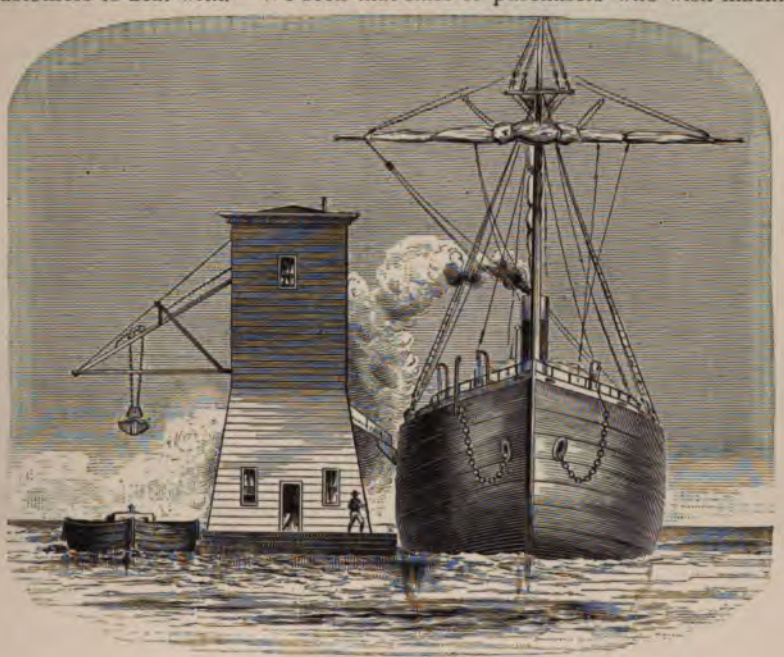
No. 116.

No. 110.

No. 116.—E. L. Hedstrom & Co., South Chicago, Ill. Four Elevators, Automatic Railways and Coal Pockets.
No. 110.—Pennsylvania Coal Co., Chicago, Ill. Three Elevators and Automatic Railways.

As the efficiency of this class of machinery depends not only upon the best design, but also upon the perfection of the workmanship, so that there will not be expensive and vexatious delays, we build all of the machinery at our own shops under the strictest supervision, both as to material and workmanship.

The laws of nature are inexorable, and no amount of enthusiasm in the maker, rhetoric in description, or fancy paint and polish, will make poorly designed and poorly built machinery satisfactory when put to the test of regular work. We, like other business men, elect what class of customers to deal with. We seek that class of purchasers who wish machinery thor-



No. 83.—Hunt's Automatic Machinery adapted to Coaling Steamships.

oughly well built, and which has every part carefully made from the best materials, and who are willing to pay whatever amount may be necessary to obtain such an article. For this reason we give no anxious thought as to whether this or that can be made a little cheaper, but have the materials and workmanship just as thoroughly good as possible. The sole criterion being whether the article will be better adapted for its work or more durable in use. We do not, and will not, make any machinery that is not as good in every respect as though the purchaser himself had selected the materials, and personally supervised the construction.

Possibly some readers may have the idea that the improvements made in this class of machinery have first been a happy thought put into the form of a drawing or model, and that then the inventor has sought, in some class of business, a customer who would adopt the device and put it into use. The various kinds of machinery built by the C. W. Hunt Company have had a widely different origin. Every improvement has been devised to meet a definite want of a customer, and not invented first and a place to use it found afterwards. This wholly eliminates experimental machinery; a real want is met, instead of an inventor's idea of what somebody ought to want.

No. 96.
Lehigh Coal and Iron Co., West Superior, Wis.

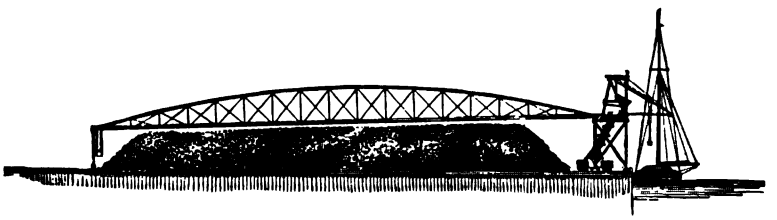
No. 95.
Milwaukee Gas Light Company.

No. 1296.

Spreckles Bros. Commercial Co.'s Wharf, San Diago, Cal. Elevators and Cable Railway.

When docks have a long water front, the Elevators are set on wheels, running on a track along the water front, or on the side and top of the building. The engine is placed in the Elevator, and the whole affair moves to any part of the wharf required. In this way only as many Elevators are built as may be needed to unload at the requisite speed; yet a very long dock can be fully utilized.

WHAT MACHINERY SHALL I USE?



No. 128.

Coal is distributed throughout the Eastern part of the United States by being carried by rail from the mines to the various shipping ports, and from thence carried to the point of consumption, in every part of the sea coast reached by water, in vessels varying in size from 60 to 3,500 tons. There is also a large distribution of coal from Buffalo, Cleveland, Ashtabula, and the various lower lake ports by water to Chicago, Milwaukee, Gladstone, Ashland, Superior, Duluth, and other points in the northwest. The remainder of the coal is delivered directly from the mines to the consumer by rail. The very large amount distributed by water carriage makes it necessary to use machinery for taking the coal from the vessels and delivering it to the carts ready to distribute to the consumers. This difference in the method of transportation divides this kind of coal handling machinery into two kinds, which are entirely distinct from each other in mechanical construction: one for unloading coal from vessels, the other taking the coal from the cars, each one delivering either directly into carts, or storing it in bins or pockets, and then delivering to carts or locomotives. The first class of machinery, viz., that taking the coal from the vessels alongside, hoisting, placing in bins and delivering to carts, is more or less complex and expensive, according to the amount of business to be done. Where the business is very large, the most complete and expensive rapid-working machinery is used. Where the amount is small, a large expenditure for the most perfect-working plant would not be justified by the saving in expense of handling. The expense and the perfection of the machinery that should be used can only be decided by taking into consideration all of the conditions of a particular location, such as the amount to be handled per annum, the greatest amount to be handled per day, the size and the class of the vessels, the location of the yard, the regularity or irregularity in the receipt or the distribution of the coal, the wages of men per day, the difficulty of obtaining suitable labor, and the liabilities of strikes. Each of these has its effect in making a definite decision. While it is impossible to accurately decide what machinery should be used, without a full knowledge of all of these points, yet the general experience of coal dealers and stevedores, handling this class of materials, is an approximate guide to the machinery that should be adopted. Taking a general survey of this class of business, and drawing our conclusions from the actual practice of men most interested in doing the work with the greatest economy, we find that—

It is usual for dealers handling 500 tons of coal per annum, or less, to use a mast and gaff, similar to that shown in cuts Nos. 1080, 126, with steel coal tubs, holding about 1-6 to 1-5 of a ton, similar to cut No. 1022, using a horse for hoisting and dumping into carts. Where the coal is to be put on the wharf, the gaff is swung around and the bucket is dumped on the pile of coal on the wharf.

No. 106.

No 117

No. 106.—Pennsylvania Coal Co., Milwaukee, Wis. Four Movable Elevators.
No. 117.—J. Conroy & Co., Charleston, S. C. Elevator and Cars.

No. 119.

No. 131.

No. 119.—G. H. Nichols & Co., Brooklyn, N. Y. Elevator and Automatic Railway
No. 131.—Milwaukee City Water Works. System of Tracks and Cars for Coal Handling

No. 120.

No. 104.

No 120.—Equitable Gas Light Company, New York. Two plants. Steam Shovel, Elevator and Automatic Railways.
No. 104.—Charles Warner & Co., Wilmington, Del. Elevator, Automatic Railway and Pockets.

When the volume of business runs from 500 to 1,000 tons per annum, it is usual to make the mast higher and to erect an elevated trestle or track, and using on this either wheel-barrows, such as shown in cut No. 1117, or a car, such as cut No. 1139.

When the business exceeds 1,000 tons per annum and running up to 2,000, the Automatic Railway (cut No. 2), elsewhere described, is usually used, instead of the wheel-barrows. In particular locations, especially for use in unfavorably-placed buildings, the cars are moved by hand, instead of running automatically as the Automatic Railway. In handling this amount of coal it is very common to use a small steam engine for hoisting, instead of horses, especially if the coal comes in cargoes of 200 tons, or over.

In a business of from 2,000 to 5,000 tons per annum, the most suitable machinery is the coal hoisting elevator and Automatic Railway, such as shown in cut No. 2, a steam-hoisting engine and steel self-dumping coal buckets, holding a half ton of coal each. With this magnitude of business it is advisable to have a coal pocket of a greater or less capacity, which is a building holding the coal and ten or twelve feet above the level of the ground, the teams driving under and drawing the coal from the bins through chutes directly into the carts. These coal pockets require to be of great strength and especially constructed for the purpose, and fitted with chutes with suitable valves and screens for convenience in use and for the delivery of clean coal.

Exceeding 5,000 tons per annum the same machinery is needed, with the exception that instead of coal tubs to be filled by hand, the steam shovel should be used, if the class of vessels in which the coal is received is suitable for its use. If the vessels are such that the steam shovel cannot be used, then the ordinary steel self-dumping buckets are to be used, holding 1-2 to 3-4 ton each, the coal being shoveled by hand. A plant of this character is capable of doing an annual business of from 30,000 to 40,000 tons, if the coal can be received during the whole season in the usual manner. The working capacity per day of ten hours would average about 200 to 350 tons, if using the ordinary buckets filled by hand, and from 500 to 600 tons per day with the use of the steam shovel.

For storing iron ore and other minerals in quantity, a modification in storage tracks is made, as it is desirable to have no posts in ore piles. In this case the Automatic Track is carried on a light iron bridge 200 to 350 feet span. The support at each end is on wheels, so that the whole affair, with the elevator, Automatic Railway and hoisting engines move bodily along the wharf, making a pile of any length. See cut No. 128.

Where the cargoes to be received are large and the despatch of the vessel important, duplicate sets of machinery are frequently used, working two hatches at the same time on the same vessel. In the lake ports, where a steamer carrying coal tows two consorts, machinery must in this case be extensive enough to unload three vessels at one time, as one vessel cannot leave until the others are unloaded. The Lehigh Coal & Iron Co., at West Superior, Wis. (cut No. 96), have nine elevators, which will work three hatches in each of three vessels, and when there are two vessels, they can work four hatches in one, and five in the other. Machinery nearly as extensive is in use at Gladstone, Mich., and at E. L. Hedstrom's dock, South Chicago (cut No. 116), and many others. The necessity for this large amount of expensive machinery is to save the time of the vessels. In all of the lake ports it is customary to work at two or more hatches of a vessel at the same time, as vessel owners will not charter unless the consignee will agree to unload from at least two hatches at the same time.

In this catalogue the different parts of the machinery needed for handling coal are described separately, as they perform different parts of the work, and more or less of these different machines are combined according to the situation and the work to be done.

No. 137.

No. 133.

No. 137.—George E. Shield's Brockville, Canada. Elevator.
No. 133.—Union Elevated Railroad, Brooklyn, N. Y. Steam Shovel, Elevator and Automatic Railways.

No. 139.

No. 130.

No. 139.—Ogdensburg Coal and Towing Company, Montreal, Canada. Two Elevators and Automatic Railways.
No. 130.—Pawtucket Coal Company. Automatic Railway.

No. 138.

No. 132.

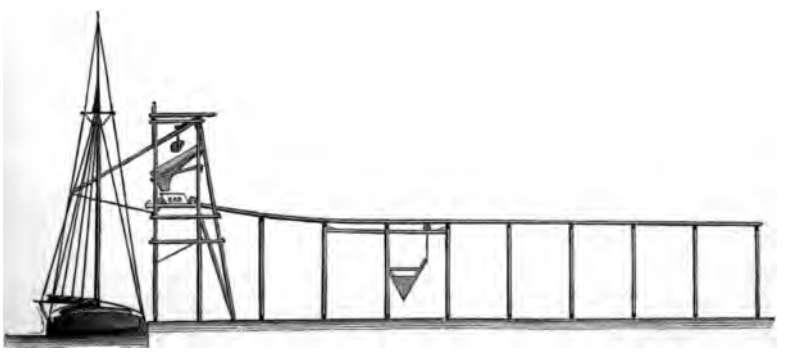
No. 138.—New Haven Gas Light Co., New Haven, Conn. Elevator and Automatic Railway.
No. 132.—Connecticut Asylum for the Insane, Middletown, Conn. Elevator and Automatic Railway.

Possibly the reader may not get a perfect idea of the operation of our machinery from the detail descriptions given elsewhere, although we have attempted to make them as simple as possible. There is only one way to get a clear and true idea of it, and that is to see it actually at work. An hour spent in seeing the general operation and examining the details, will do more to give you a correct idea of it than all the descriptions and photographs that we can publish.

Since 1873, we have been building this class of machinery, and the theory that we have constantly had in view is, first, that it is not advisable as a business to build machinery for temporary work, but only for places where it would be used in a regular methodical business when durability and economical working would please the purchaser, and also advertise it to others, and next, that we would build everything in design, materials and workmanship, just as carefully as though the purchaser was personally present to inspect every part, and that for such design, materials and work, we would charge a just and reasonable price. No matter what a customer might say, or think that he wanted, we knew that if he wanted the machinery to use in a regular business, he really wanted the materials good, and built with careful workmanship ; and we have persistently refused to build lighter or cheaper machinery, believing that such work would only be working ourselves out of business, as the tendency of modern machinery is to do work faster and at less expense per ton.

Persons who do not fully comprehend the hard usage coal machinery gets, or who do not fully understand the quality of our work, have supposed that our machinery is too heavy, and too expensive ; but experience has shown that for durability and freedom from repairs, it is not too heavy, as its general adoption by capable and successful business men in all parts of America amply proves.

There are now about 4,500,000 tons of coal, ore and phosphates, handled by this machinery each year, by ordinary workmen, whose care of the machinery in many cases is thoroughly bad, yet in all this time there has never been a breakage of anything that we have furnished that has caused the death of a workman, although coal handling is considered a dangerous business. While we cannot expect this record to always last, yet it has been exempt from serious accident so long that we take especial pains to have our machinery so carefully made and inspected, that the good record will continue, and the danger to the men working it, will be reduced to a minimum.



No. 3.

Side view of an Elevator and Automatic Railway for handling coal or ore.

No. 115.

No. 114.

No. 115.—Calumet and Hecla Smelting Co., Lake Linden, Mich. Four Movable Elevators and Automatic Railways.

No. 114.—Columbus & Hocking Coal and Iron Co., Manitowac, Wis. Four Movable Elevators, Automatic Railways and Pockets for Coaling Locomotives.

No. 108.

No. 113.

No. 108.—Lehigh and Franklin Coal Co., Milwaukee, Wis. Four-mast Elevators.

No. 113.—C. H. Reynolds & Sons, Brooklyn, N. Y. Elevator, Automatic Railway and Coal Pocket.

No. 112.

No. 107.

No. 112.—Louis Henes, Jr., & Co., Milwaukee. Two Elevators and four Automatic Tracks.

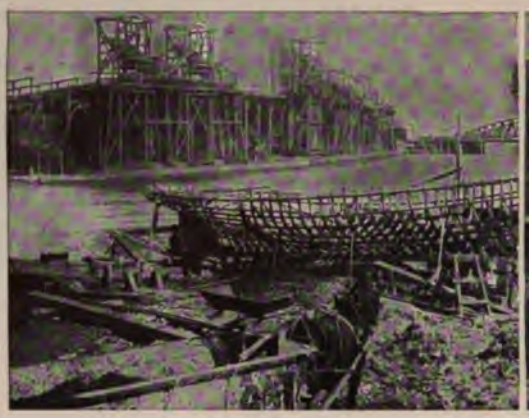
No. 107.—Union Ferry Co., Brooklyn, N. Y., Atlantic Ave. Ferry. Elevators and Automatic Railways. Similar plants are at the Catherine and Hamilton Ferries.

HUNT ELEVATOR.

No. 106.

This elevator is designed for rapid and economical hoisting of coal and ore from vessels. Whenever the magnitude of the business, or the height of the hoist makes it unadvisable to use the ordinary mast and gaff, this elevator should be used. The bucket is carried from the hold of the vessel to its dumping place, every trip in exactly the same course, whether it is large or small, and at any rapidity which the business demands. The motions of the bucket are fixed, so that there is none of the ordinary swinging caused either by a difference in the speed of hoisting or by the effect of wind. The bucket is carried exactly where it is wanted, rising vertically from the hold of the vessel to the booms, running up the boom and dumping at a fixed place.

These elevators are built of different sizes and proportioned to suit the work to be done. The lighter size is especially adapted for coal or ore hoisting, using any size bucket up to one ton capacity each. A heavier elevator is built for handling the steam shovel that is especially arranged for rapid and safe work. A third size is built of massive proportions for handling boxes containing 10 tons of coal for shipping from cars into vessels. In each of these styles the booms that project over the vessel are moved horizontally over the wharf when not in use. As they swing on a vertical axis one man can easily swing them into position, where they are held by guy ropes. The booms do not move while the elevator is in operation, but are swung to a position that will permit the steam shovel or bucket to drop vertically into the hold of the vessel. As it is sometimes difficult to get the hatch of the vessel directly opposite to the elevator, the booms are adjusted to swing sideways to bring the steam shovel or bucket to any desired point. The chock on the booms is movable so that the bucket can be made to descend at any point from the extreme outer end of the booms to the inner side of the vessel. In operation, the engine hoists the bucket vertically from the hold of the vessel until the running block attached to the tub strikes the truck on the projecting booms. As the engine continues to hoist the tub and truck, both run up the boom until over the hopper or car, when the bucket strikes a dumping attachment which dumps the load of coal out. The rope is then slackened, permitting the truck and the bucket to run down the booms until the truck strikes the chock, which arrests the motion of the truck. As the engine continues to pay out the rope, the bucket then descends vertically into the hold of the vessel, when the steam shovel fills itself



No. 101.

No. 103.

No. 101.—Robert Law, Chicago, Ill. Six Elevators and Automatic Railways. The Coal Shed covers five acres.

No. 103.—Brooklyn Sugar Refining Co., Brooklyn, N. Y. Elevator, Automatic Railway and Coal Pocket. The Automatic Car track is 80 ft. above wharf.

No. 121.

No. 123.

No. 121.—Baker Bros., Chicago, Ill. Two Elevators and Cars.

No. 123.—J. L. Hathaway, Chicago, Ill, Kingsbury St. Yard. Two Movable Elevators and Automatic Railways.

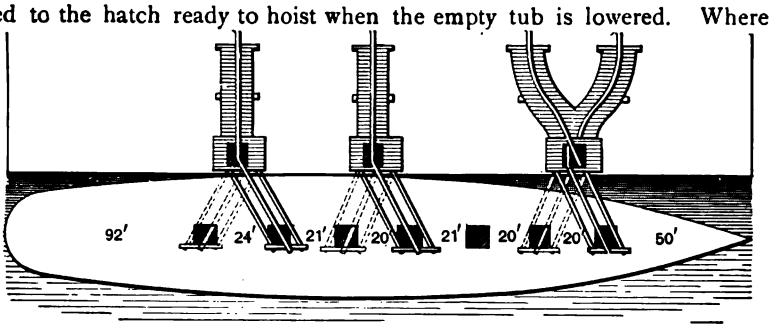
No. 109.

No. 124.

No. 109.—Joliet Steel Co., Chicago, Ill. Six Elevators and Automatic Railways for handling Iron Ore.

No. 124.—E. L. Hedstrom & Co., Chicago, South Side Yard. Four Elevators and Automatic Railways.

with coal, or in using ordinary tubs the hoisting block is unhooked from the empty tub and hooked on to a full tub, which the men have filled in the hold while the previous tub was being hoisted. In hoisting coal with a steam shovel but one is used, as it takes only five seconds for the shovel to fill itself with coal; but when the material is shoveled by hand, several tubs must be used—usually three—one being hoisted, one being filled, and a filled one being moved to the hatch ready to hoist when the empty tub is lowered. Where speed of

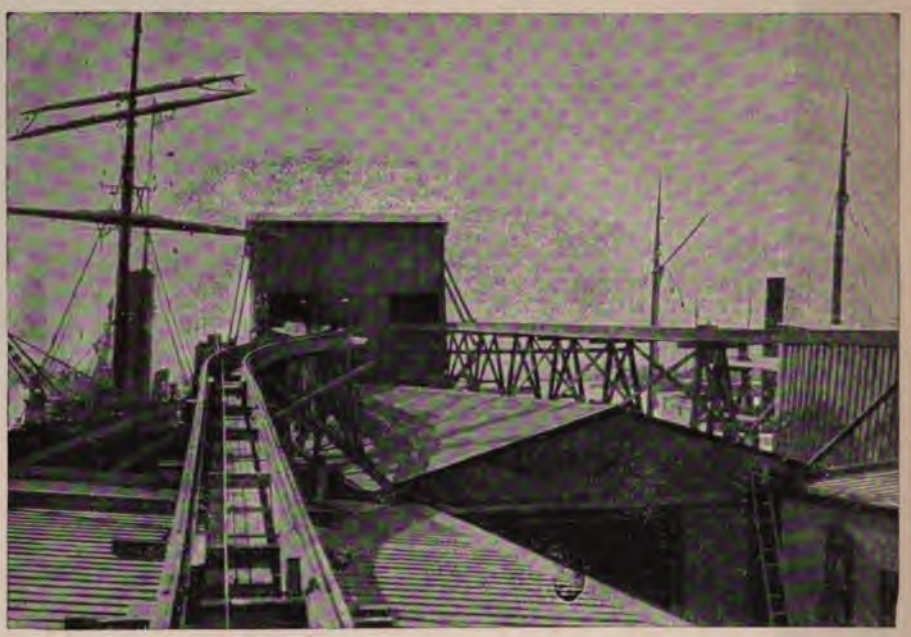


No. 30-Three stationary elevators. The shovel can be swung to the position shown by the dotted lines and work equally well.

unloading is slow, two can be used, but where the greatest speed possible is necessary, in large vessels, four and sometimes five tubs are used at one hatch, each carrying from 1,000 to 1,500 pounds of coal. When not in use, the whole projecting parts of the elevator swing sideways over the wharf, leaving the waterway unobstructed.

To unload from two hatches of a vessel at the same time, two elevators are used, they being erected as far apart as the average distance between hatches of the vessels to be unloaded. When the hatches are closer together than the elevators, the booms of elevators are swung toward each other until they are in position to allow the tubs to descend into each hatch. If the hatches are further apart, the booms are swung away from each other in like manner. They can be adjusted to any position, even while in operation. When docks have a long water front, the elevators are set on double flange wheels running on a track parallel with the water front, or on top of the trestle work or the building. The engine is placed inside the elevator and the whole affair moves to any part of the wharf required. In this way the whole of the wharf front is available for hoisting, and only as many elevators are built as may be needed to unload at the requisite speed. In these cases the boiler is usually placed on the ground and steam carried by a pipe running parallel to the front of the wharf, from which the engine takes steam by connection at any point. It requires about the same effort to move the elevator on its track as to move an ordinary loaded freight car. These elevators have been built in all parts of the country to unload from all classes of vessels and barges, for use in quarries and in buildings, and variations in strength, the arrangement and the details have been made to suit almost all cases that occur in practice.

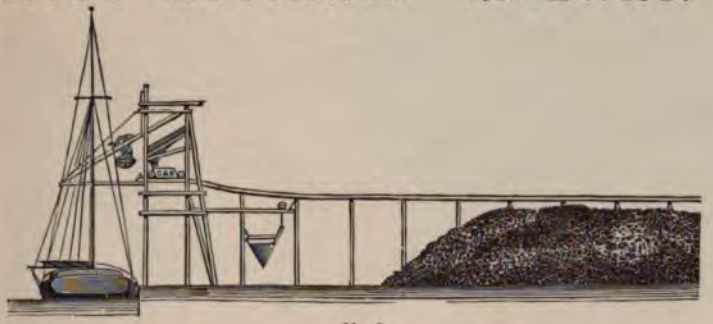
The earlier elevators were not as complete and elaborate as those now built, and as improvements were made one part would frequently, interfere with another, the bearing surfaces would not be sufficient, or sufficient precautions were not taken against carelessness in operation, but these difficulties were eliminated step by step until the present machinery embodies the experience of hundreds of men in all parts of the country, and in almost all conditions of work and operated by all classes of workmen. Elevators for coal hoisting, with the steam shovel or, for ordinary buckets, are made to standard size and the working parts to accurate gauge. They are always kept in stock ready for immediate shipment. Special sizes are made to suit any special work.



No. 1293.
Alex. Kerr Bros. & Co., Baltimore, Md., Elevator and Automatic Railways. View of tracks showing curves in tracks at loading end.

No. 1305
Central Forge Works, Whitestone, N. Y.

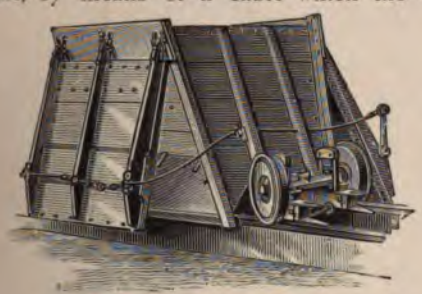
HUNT AUTOMATIC RAILWAY.



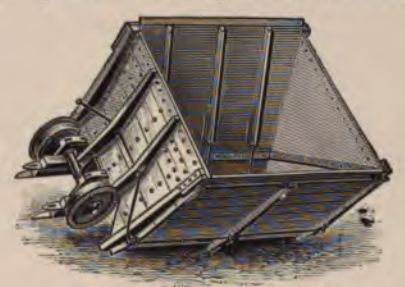
No. 2.

"The Automatic Railway" is now in general use for running the coal back from the front of wharf to the storage bin or pocket. It is an elevated self-acting railway, operated entirely by gravity, there is no steam, horse or manual power required in its operation. The chief peculiarity consists in storing sufficient energy which has been acquired by the loaded car descending an inclined track, which is utilized after the load has been discharged, to return the empty car back to the place from whence it started. The coal is hoisted from the boat, either by horse or steam power, and dumped into the car by an attendant. One man only is needed to operate the railway, who starts the car when filled, but does not accompany it. The car runs down the track, dumps its load at any desired point and returns to the hand of the workman. It runs with great rapidity, making a trip of three hundred feet, dumping its load and returning in about thirty-five seconds. The car is so entirely automatic that it requires no attention whatever from the time of starting until its return to the workman for another load.

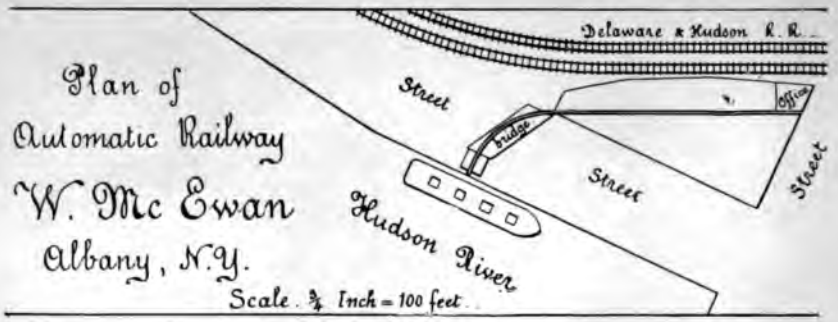
When a loaded car reaches the end of its journey it has raised a weight to a certain height, by means of a cable which the car picks up while running down the track; the fall of this weight is sufficient to return the empty car back to its starting point. The weight rises only a limited distance, its object is to give the car a start back, its momentum carrying it the remaining distance. Care has been taken to make the raising of the weight a gradual movement, so that as few sudden strains as possible are brought on the various parts. Great care has been taken in the proportions of the different parts to get this machine



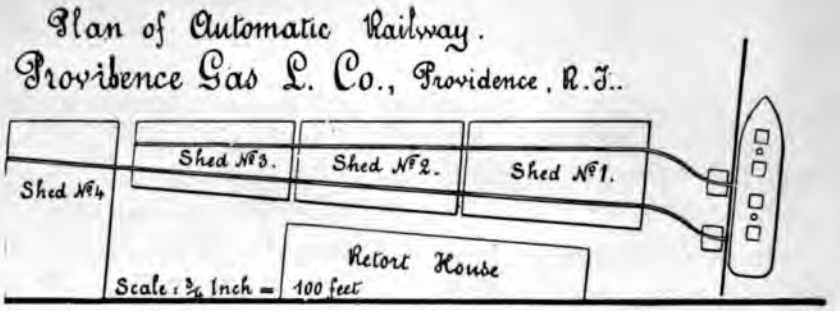
No. 1024.—Regular Automatic Car.



No. 1016.—Special Automatic Car.



No. 55.



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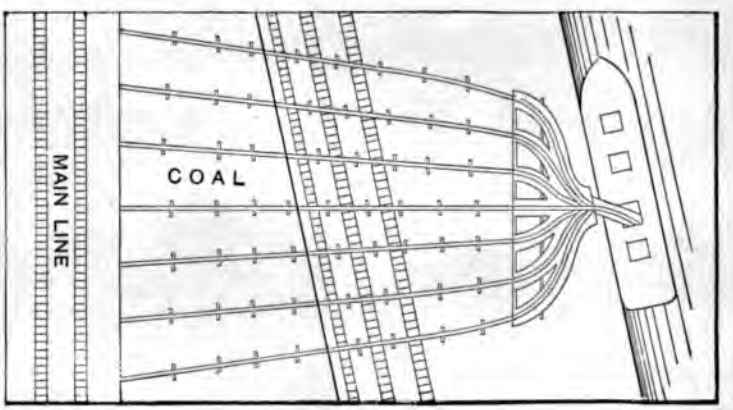
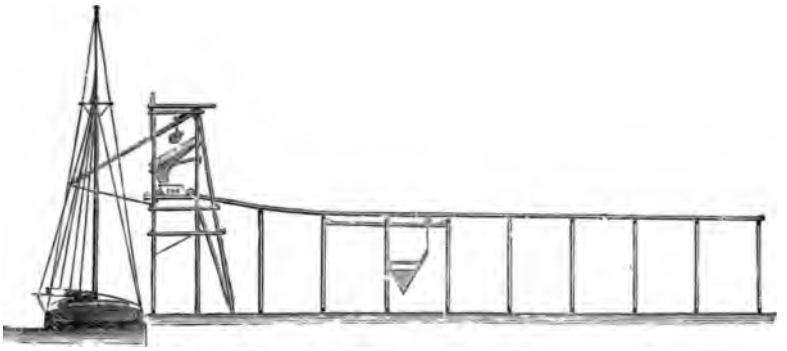


No. 73.

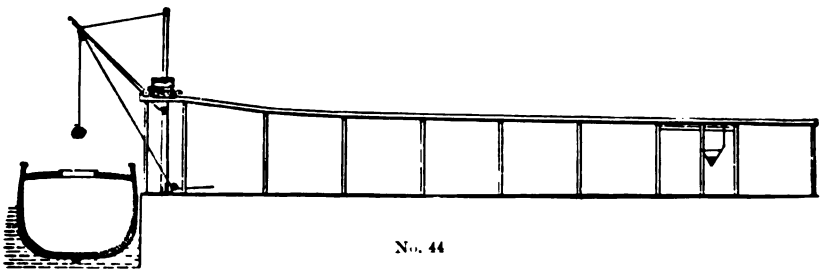
Elevator with seven Automatic Tracks, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

Curves can be used on the Automatic Railway, but they must be at the loading end and not where the Coal is stored.



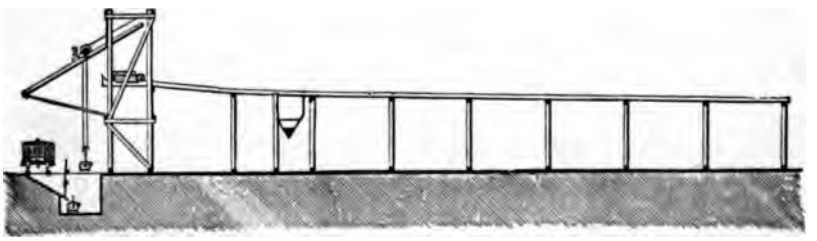
No. 3.

Side view of an Elevator and Automatic Railway for handling coal or ore.



No. 44

Automatic Railway, for handling coal with the ordinary mast and gaft.



No. 29.

Elevator and Automatic Railway, arranged to take coal from dump cars.

No. 1318.

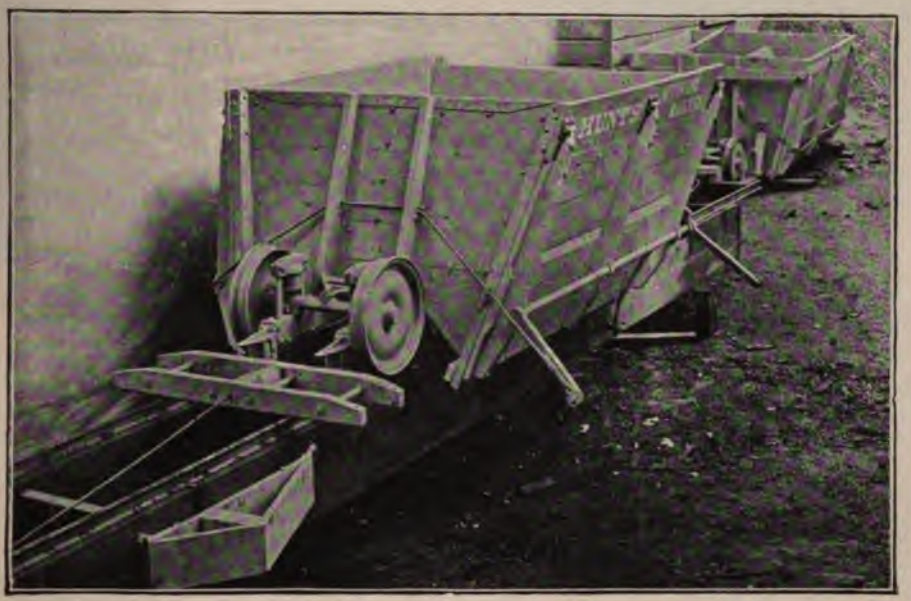
Ontario Coal Co., Toronto, Canada. Fitted with Hunt Machinery.

No. 1319.

Conger Coal Co., Toronto, Canada. Fitted with Hunt Machinery.

perfectly automatic in its working, and at the same time be thoroughly durable and free from destructive wear or delays.

The regular cars used on this track discharge the load by opening the sides by means of a tripping block placed on the track, letting the coal run out on each side of the track. The bottom has a ridge in the centre so that the material runs entirely out; the sides are fastened, not to the car, but to each other, so that if one is unfastened, both are. The load is always discharged evenly and without danger of overturning the car, although it is a very narrow gauge.



No. 1140.

Automatic Railway Car, with Truck, Dumping Block, Cross-bar, &c.

The car is built of wood and lined with sheet steel in the best manner, with self-adjusting bearings, rubber springs and steel axles. The bearings are somewhat peculiar, as they are so arranged that the car runs around a curve of thirty feet radius theoretically as easily as on a straight line, and practically nearly as easily. A description of these bearings will be found in our catalogue on Industrial Railways.

The gauge of the track is narrow, twenty-two inches between the flanges of the wheels. The steel wire rope that raises the weight is detached from the car except during the time that the car is raising the weight and receiving the impulse to return; this permits the loading end of the track to be curved to suit almost any situation. The engravings illustrating the arrangement of tracks in various yards will show that the tracks can be adapted to almost any situation.

No. 1468.
Citizens' Gaslight Company, Brooklyn, N. Y.

No. 1469.
Zo Nelson & Son, Brooklyn, N. Y.

This railway can be easily erected in any yard, as there are no confusion of ropes, no switches or turnouts, no loose pieces to get lost or stolen, and there is nothing to take care of or put away. The car is left just as it was used, and is ready for work at any time. The returning weight can be placed at any part of the track desired and be entirely boxed in and coal piled around it; it needs no attention whatever.

All material received over the railway can be accurately weighed without delay or extra expense, by placing platform scales in the track at the loading end, the workman who loads the car also weighs the load, and while the car is running down the track enters the weight in the tally-book.

The expense of storing coal with the Automatic Railway is reduced to the wages of one man. The expense is the same whether a small or large amount is handled.

No. 1291.

The above shows Automatic Track, very irregular on account of wharf settling. Between 3000 and 4000 tons coal were handled over this railway, with automatic car, under these conditions.

We furnish the car complete, the steel wire rope, sheaves, cross-bars, spikes, fish joints and all the working parts, together with drawings for the erection. The intention is to furnish every part so that the purchaser will have no blacksmith or machine shop bills to pay. These automatic cars and all parts of the machinery are always kept in stock, [illegible] can be made.

[illegible] engr[illegible]ks, fitted with the Hunt Machinery, show the extensive use of this [illegible] and [illegible]tions it is adapted to. It is at work in so many places [illegible] who are interested to go and see it in practical opera- [illegible] in the list of users accompanying. As this is a special [illegible] length as will suit each particular location, we would [illegible] of using it, send us a description of his location, and [illegible]te of the cost without charge.

No. 1300.

Lehigh & Wilkesbarre Coal Co., Salem, Mass. Three Movable Elevators and Steam Shovels.

No. 1299.

Lehigh and Wilkesbarre Coal Co., Salem, Mass. Rear View or Elevators, showing arrangement for loading Railway Cars.

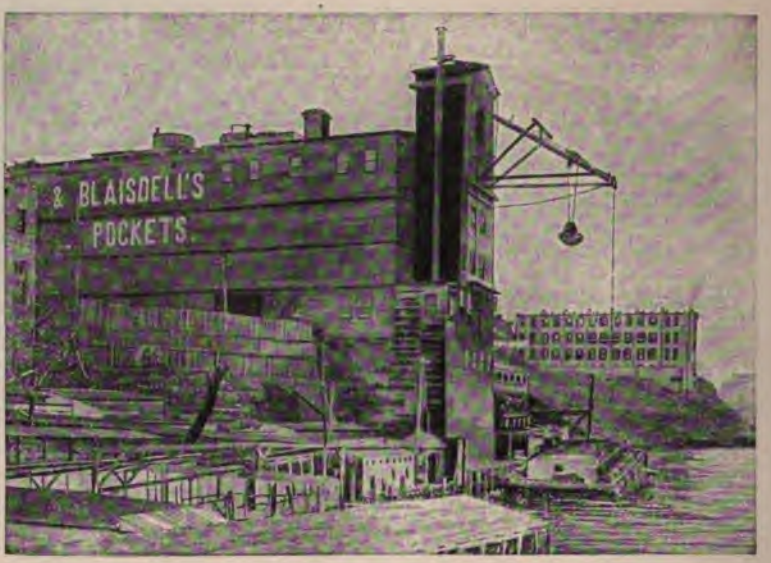
HUNT STEAM SHOVEL.

No. 154.—Ready to Close

No. 155.—Four seconds later.

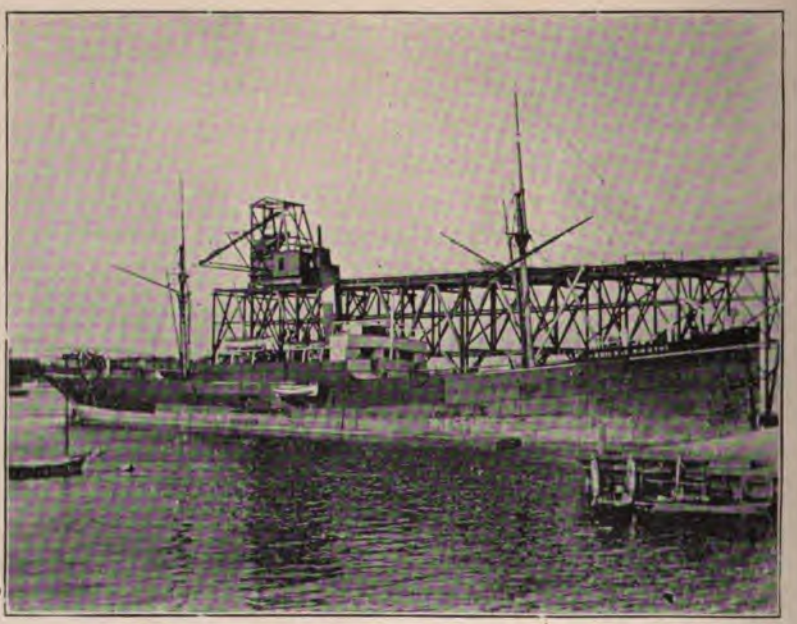
Shoveling coal in vessels is not only very hard work, but requires considerable skill, and owing to the intermittant character of the work and the desirability of discharging a vessel quickly, the wages paid are far above ordinary prices for labor. In most of the coal handling centers there are laborers who make a business of shoveling coal, and in many places they have formed a coal shovelers' union, and arbitrarily fixed the price not only for the shoveling of the coal, but also for the hours in which they will labor and the number of men that will be permitted to work in a vessel at a time, and in many places they require the coal dealers to sign an agreement with them to respect their rules.

In handling Anthracite coal, all the breakage of the merchantable size to pea and dust is nearly a total loss to the dealer, and the reduction of this breakage is one valuable feature of the steam shovel. The scoops reach 7 feet, pushing their way under a ton to a ton and a half of coal, which causes very much less breakage than taking a ton of coal up in about 150 shovels full and dashing one on top of the other in a tub. Another feature is, that no men are at work under the shovel, as it fills itself entirely, and when men are needed in the hold it is not to assist the shovel, but it is to scrape the coal out from under the deck where the shovel cannot reach, so the men are not working under the shovel as they do in ordinary coal hoisting. It picks up the coal as clean as can be done by a hand shovel, and does not, and cannot injure the ceiling of the vessel in the least. The handling of this shovel by the engineer is an extremely simple matter, a single drum-hoisting engine of sufficient power hoists the shovel up, and when it reaches the top of the booms over the hopper, the shovel automatically dumps itself. The engineer has nothing to do except to hoist it up to the designated point, it is then lowered into the hold of the vessel, with the scoops open, ready for filling. The engineer then starts his engine, when the shovel automatically fills and is hoisted the same as the preceding one. There is no more skill needed in hoisting this shovel than in hoisting the ordinary tub, and in most cases it requires less skill, as we attach to all our engines for this purpose, a governor that runs the engine at the correct speed at every point



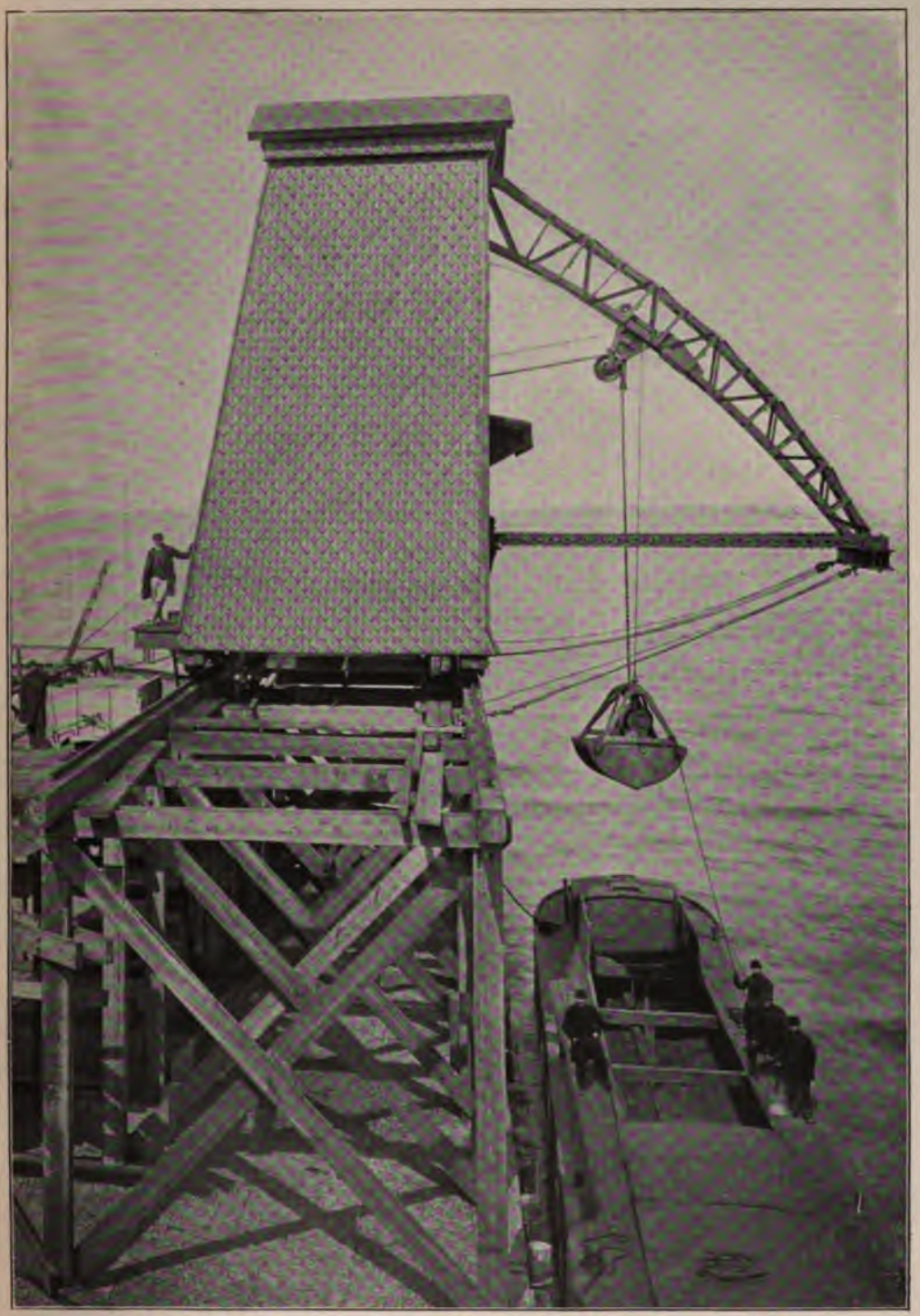
No. 1292.

Curtis & Blaisdell's Coal Pocket, foot of 56th Street, East River, N. Y., using Hunt's Steam Shovel. Vertical lift 109 feet.



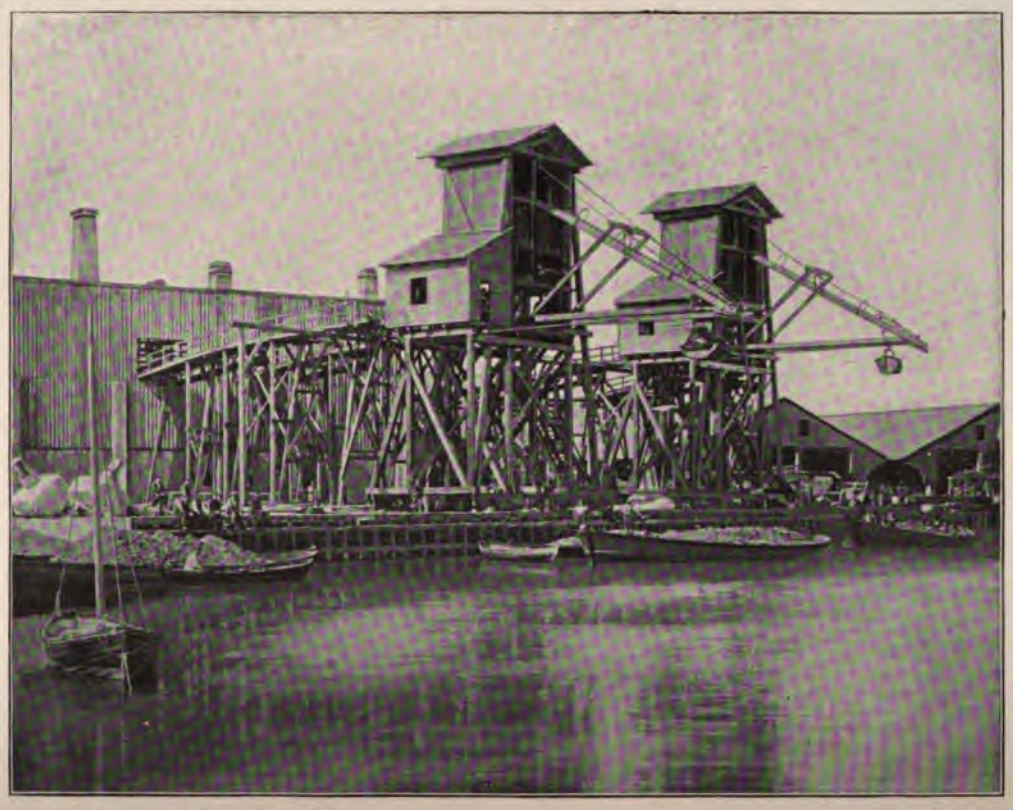
No. 93046.

Bergenport Chemical Co., N. J.



No. 940.420.

STEAM SHOVEL AND ELEVATOR AT SOUTHERN POWER STATION,
BROOKLYN HEIGHTS RAILWAY COMPANY.



No. 94,036.

STEAM SHOVEL, ELEVATORS AND AUTOMATIC RAILWAYS.

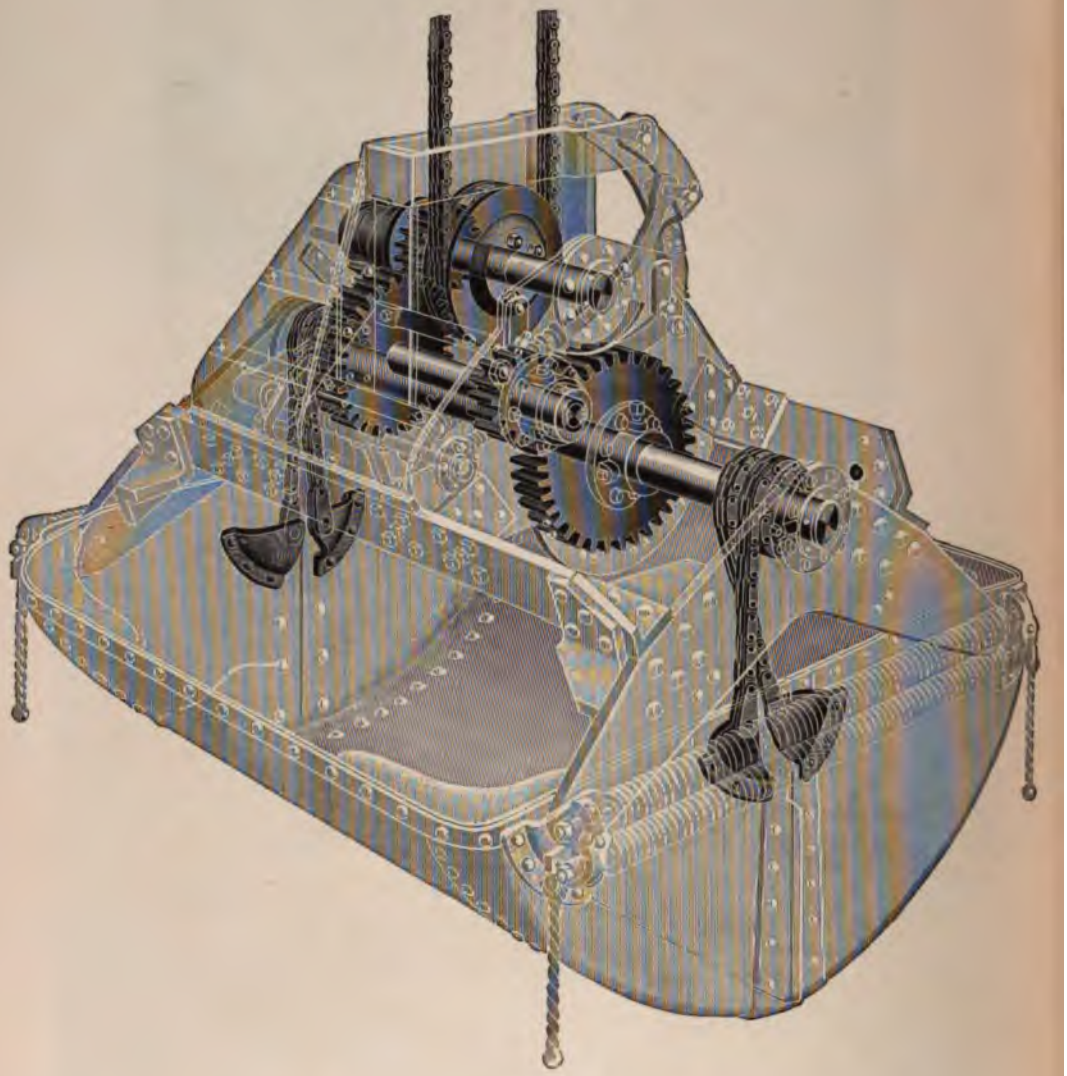
Built by the C. W. Hunt Co. for the Eastern Gas Works, Copenhagen, Denmark.

No. 97.

Hunt Steam Shovel taking coal from cars.

No. 1306.

Winifrede Coal Co, Cincinnati, Ohio. Shovel for Kanawha Lump Coal.



No. 1303.

Hunt Steam Shovel. Details of the working parts.

in the hoist, changing it from slow to fast, and from fast to slow, automatically, so that the engineer in hoisting throws the throttle wide open and leaves it open until the shovel has dumped its load in the hopper, the governor varying the speed of the hoisting engine exactly as it was set to do for accomplishing the best work.

The saving in the expense of unloading a vessel with the Steam Shovel is very great. The average expense for the workmen who attend to the shovel in the vessel is usually not over one cent per ton and the total labor expense of unloading the coal from the vessel, accurately weighing it and storing it in coal pockets ready to draw into the carts, is in many places less than two cents per ton, and in no case heretofore has the expense been greater than three cents per ton. The wear and repairs of the machinery are very slight indeed. The expense for hoisting chain is almost exactly the same amount per ton of coal hoisted as manila rope to hoist the same quantity, and the repairs to the shovel in a series of years would probably not exceed 1-10th of a cent per ton.

In vessels suitable for the steam shovel no shovelers are required, the shovel filling itself automatically and the whole cargo is discharged without shovelers, with the exception that coal in the corners of the boats must be scraped out so that the shovel can reach it. In many vessels the hatches are so large that nearly all the cargo is discharged before a workman enters the boat for any purpose. In less convenient vessels, it is necessary to have one and sometimes two men to assist in getting the coal out where the shovel can reach it. In large vessels having hatches, as large a proportion of the cargo cannot be taken out with the shovel as in those that are made especially for coal carrying. In big vessels, the amount that it would be necessary to shovel forward would vary from a small percentage to 10 or 12 per cent. where the hatches were inconvenient. The steam shovel carries from one ton to one ton and a half per load and makes about one trip per minute, so that the speed in unloading is at the rate of from 60 to 80 tons per hour, and at times, when everything is favorable, over 100 tons per hour. The usual amount taken out in ten hours, taking into consideration all the delays that usually occur in shifting from hatch to hatch, and in cleaning up the vessel, runs from 450 to 550 tons at one hatch.

In the construction of the shovel the greatest pains are taken in the materials and workmanship, to secure immunity from delay and durability in use. Every part is made to a standard templet so that in case of an injury to any part, it can be renewed at once with a certainty of a fit. All the bearings in the shovel are bushed with bronze bushings that can be pushed out and a new one inserted in its place, as they are all made to templets. In this way, no matter how long the shovel is in service, the working parts can be kept in as perfect order as when it was first received.

The advantages of this Steam Shovel are :

That it fills itself automatically.

It reduces the breakage of coal

It reduces the expense and increases the speed of discharging.

It is safer for the workmen.

A single drum engine is used.

There is no swinging or twisting in hoisting.

No. 1290.

Orient Guano Co., Orient, N. Y.

No. 1294.

Cable Railway Trestle of L. G. Burnham & Co., Boston, Mass. Coal is carried over one-quarter of a mile back from the wharf.

HUNT CABLE RAILWAYS.

FOR HANDLING MERCHANDISE.

No. 1195.

Cable Railway and Car, West Point Military Academy. View near the Gas Works.

CABLE Railways are operated by a running wire rope, to which the cars are either permanently or temporarily attached. The rope moves at any desired speed, taking the cars with it, either up inclines, or around curves, as the situation may demand. It is a very old system of operating cars, but it is limited in its application. Excluding passenger railways, it is used most extensively in mine haulage and in manufacturing establishments in carrying heavy materials from point to point as may be needed. As any amount of power, strength and flexibility can be obtained in this way it is exceedingly well adapted for many situations, especially those where there are very heavy grades, or where there are many changes of curvature in the line. We build two classes of these railways.

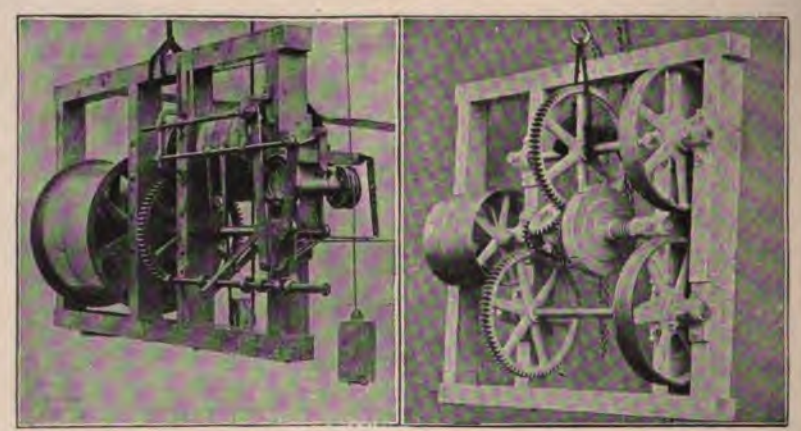
First.—Light Cable Railways for use in manufacturing establishments, where the loads are light, the grades moderate, and the magnitude of the business comparatively small.

Second.—Heavy Cable Railways of any desired strength, where loads of several tons are to be carried either on a level, up heavy grades, or over long distances.

These Railways are driven by power. The plans shown in the engravings, give some of the arrangements of tracks and curves that are in use. The cars are built to suit the particular work to be done. As these railways are built to suit the different

No. 152.

Cable Railway. Horseshoe bend, at the upper end of the West Point Military Academy.



No. 1125. No. 1124.

MOTORS USED FOR DRIVING THE HUNT CABLE RAILWAYS.

No. 1125. Single drum motor for short roads, with automatic reversing device.

No. 1124. Double drum motor for long roads, with equalizing gears to make the strain on each driving drum exactly the same.

circumstances, it is difficult to give a general description, but a brief description of the arrangement of the tracks of the Orient Guano Company, of Orient, N. Y., and the West Point Military Academy, of West Point, N. Y., will serve to illustrate the two classes of railways.

Engraving No. 18 shows a plan of the cable tracks of the Orient Guano Company. The problem here was—

To take phosphate rock from a vessel and deliver into the rock storage shed.

To take pyrites from a vessel and deliver to the furnaces.

To take coal from a vessel and deliver to the coal bins.

To take manufactured goods from the building and deliver to a vessel.

The works had been erected and in operation for many years, the material being handled by teams. A direct connection could not be made between the dock and the rock storage sheds, on account of a series of oil tanks and presses (not shown in the engraving), which occupied the space between the manufactured goods building and the wharf. The wharf was already constructed, and was not in line with the building containing the manufactured phosphates. The furnaces for making the sulphuric acid were near the condensing chambers, a considerable distance away from the main buildings.

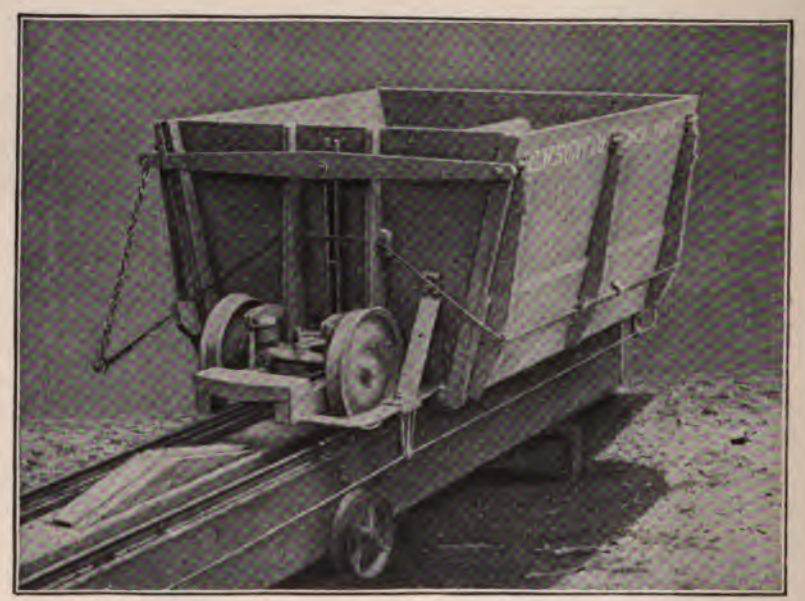
No. 1296.
Spreckels Bros. Commercial Co., San Diego, Cal. Two Elevators and Cable Railway.

In order to handle all of these materials cheaply, we furnished a Cable Railway running from the wharf front down the pier, then curving to run through the manufactured goods building, thence running over the Coal Bin and around to the furnaces, and coming to the rock storage shed from the rear, using two cars attached to an endless cable, which was driven by a belt from the shaft in the mill. The whole system of tracks is elevated about eighteen feet above the ground, except at the wharf front where the elevation is about twenty-five feet, in order to spout phosphate direct into a vessel.

When the car is loaded at the front of the wharf, the attendant starts the cable in motion, which runs the loaded car down, bringing the empty car back. The cars are like engraving No. 1148 and dump automatically at any point. The whole track is 1469 feet long. When the rock is being unloaded the cars run the whole distance, but when other materials are to be handled, one of the cars is detached from the cable and moved by hand to the point where the material is to be unloaded, and again attached to the cable.

No. 1194.

Two-ton Cable Car for carrying coal or ore. This car has the bottom inclined each way to the sides, which open and dump the load on each side of the track.



No. 1148.

Cable Car for carrying phosphates. The bottom is very steep, coming nearly to the top of the car. The cable runs on one side of the track. The wedge block in the centre of the track automatically dumps the car at any point it is set.

The cars then run only the distance needed to do the work. The manufactured goods are carried to the front in the same manner that the materials are taken into the yards.

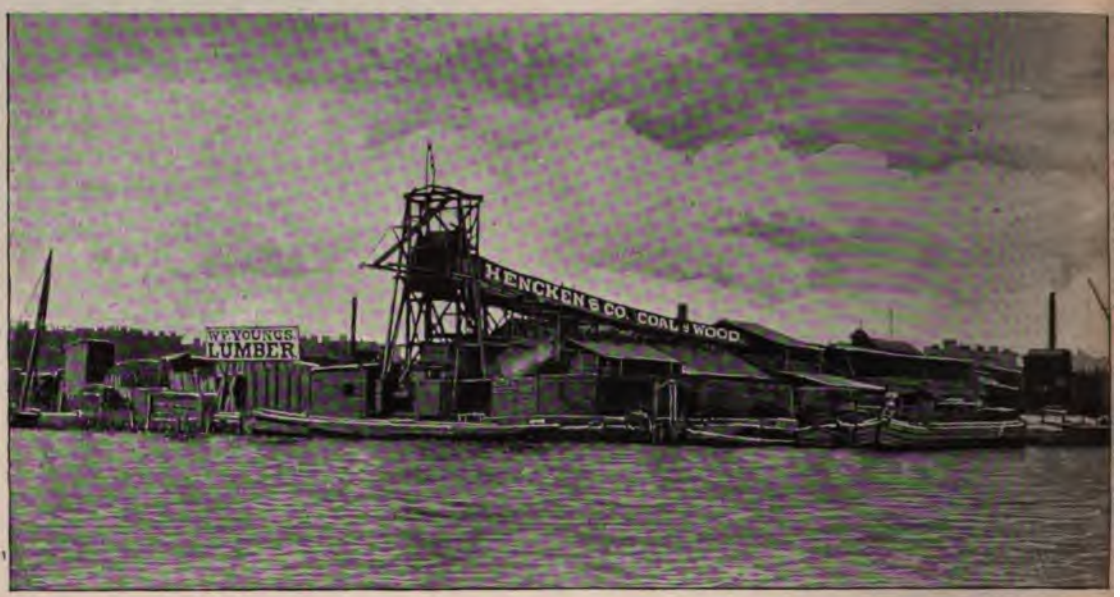
The tracks at the West Point Military Academy will illustrate the heavier Cable railways. The problem here was :

To take coal and other supplies at the wharf and carry them to the top of the bluff, about 130 feet vertically, and 1200 feet horizontally. As the face of the bluff is very irregular, it was necessary to make the track run in a circuitous route, about 1800 feet, and this had to be so located as not to be unsightly by reason of prominent trestle work, and also in such a position that it would not interfere with the range of the batteries on the bluff. The plan shown in cut No. 1179 illustrates the circuitous route that was chosen, and the location of the buildings that were to be supplied by this railway. The system adopted was a double track, narrow gauge railway, having an endless cable. This cable is run continuously by a steam engine at a very slow speed—between two and three miles an hour. The cars used in this case carry about two tons of coal each, and when loaded

No. 1179.

Hunt Cable Railway at West Point Military Academy, West Point, N. Y.
This railway is used to carry coal and supplies to the storehouses on the bluff, 130 feet above the wharf.

at the wharf are gripped to the cable and proceed on their course, the slow speed making it safe to run without an attendant. This car follows the track around over the buildings, dumping its load automatically at any desired point, and returning again to the wharf, making an entire circuit of the tracks. When it has reached the wharf a workman steps on board, unfastens the grip, and runs the car on to the loading track, where it is loaded and again sent over the tracks As many cars can be used as needed ; the idea being to run the cars at a slow speed, and to use enough of them to give the requisite capacity for handling the coal. The slow speed makes it very safe, and also ensures a freedom from



No. 1470.

Cable Railway for carrying coal.

No. 1347.

Cable Railway. Plymouth Cordage Co., Plymouth, Mass.

No. 940,422.

GENERAL VIEW OF STEAM SHOVEL, CABLE RAILWAY, AND CONVEYOR AT SOUTHERN POWER STATION, BROOKLYN HEIGHTS RAILWAY COMPANY.

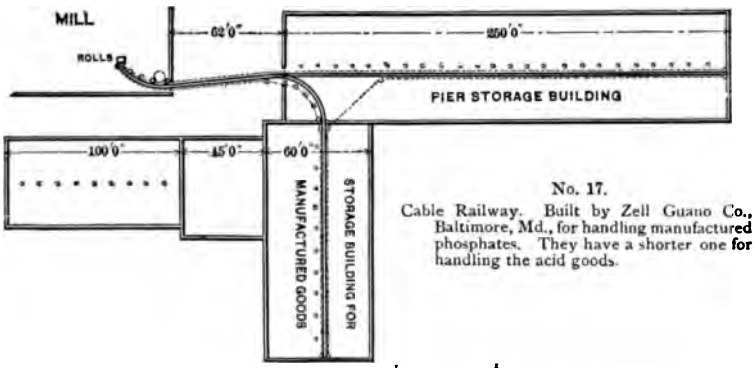
No. 910,421.

GENERAL VIEW OF CABLE RAILWAY AT SOUTHERN POWER STATION,
BROOKLYN HEIGHTS RAILWAY COMPANY.

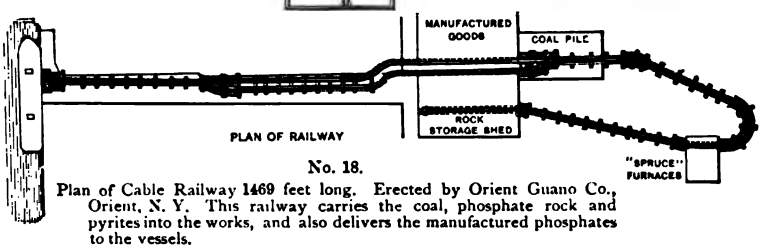
accidents, while the capacity is attained by the use of a greater number of cars. So long as there is dumping room at the coal buildings, there is no workman on the line of the tracks, except at the loading point; and the coal is delivered 1800 feet away at substantially the same cost that it would be 100 feet away, with the exception of the increased cost of steam power and the first cost of the plant.

To insure safety against accidents, a friction wheel is introduced between the power and the cable. When the load is first started this friction is gradually tightened until the cable is doing its usual amount of work. In case of any accident throwing a greater strain upon the cable, the friction will slip and at once give notice to the engineer that something is wrong. The weight and capacity of the cars can be made to suit the work to be done.

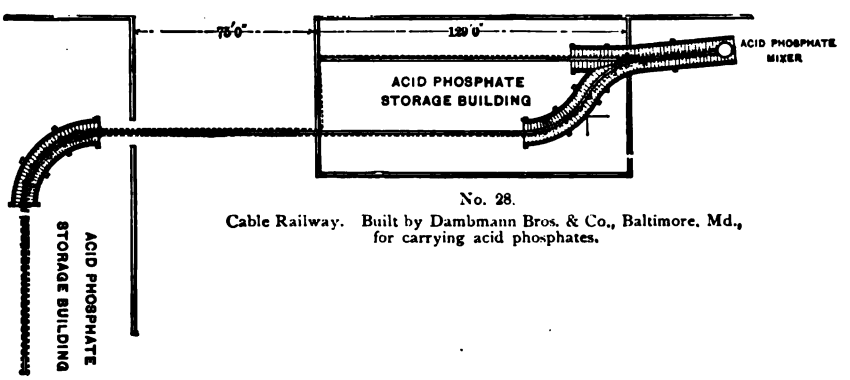
As these tracks are built to suit the special work to be done, it is necessary in each case for us to make detailed plans for their erection, and estimates of the cost. We will be pleased to make estimates of this kind upon receipt of such details as will be necessary to clearly understand the location and the work to be done.



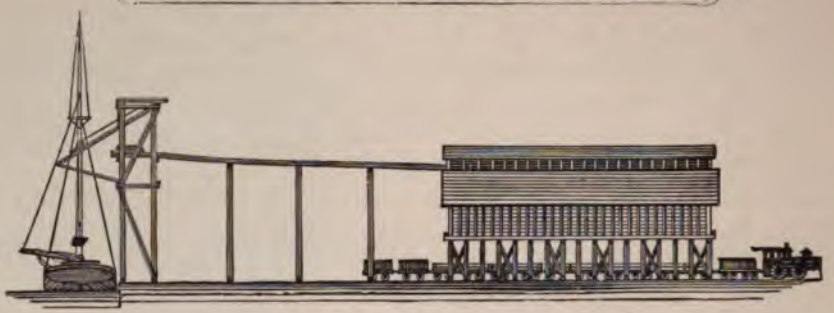
No. 17.
Cable Railway. Built by Zell Guano Co., Baltimore, Md., for handling manufactured phosphates. They have a shorter one for handling the acid goods.



No. 18.
Plan of Cable Railway 1469 feet long. Erected by Orient Guano Co., Orient, N. Y. This railway carries the coal, phosphate rock and pyrites into the works, and also delivers the manufactured phosphates to the vessels.

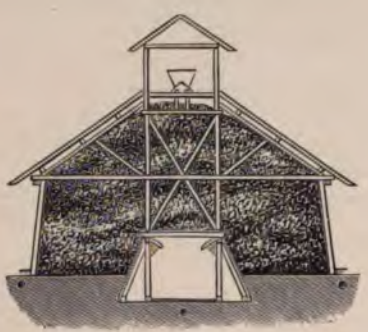


No. 28.
Cable Railway. Built by Dambmann Bros. & Co., Baltimore, Md., for carrying acid phosphates.

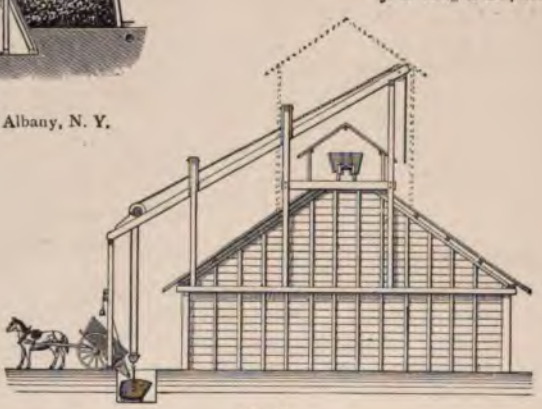


No. 27.
Coal Pocket at the Asylum at Willard, N. Y. Capacity 3000 tons.

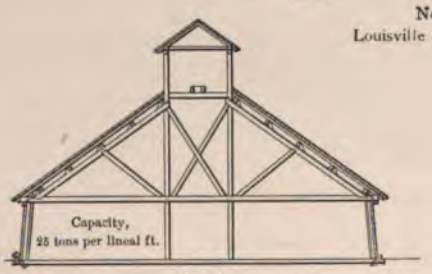
No. 78.
J. B. King & Co., Staten Island, N. Y.



No. 79.
G. W. Luther & Sons, Albany, N. Y.



No. 24.
Louisville Gas Light Co.



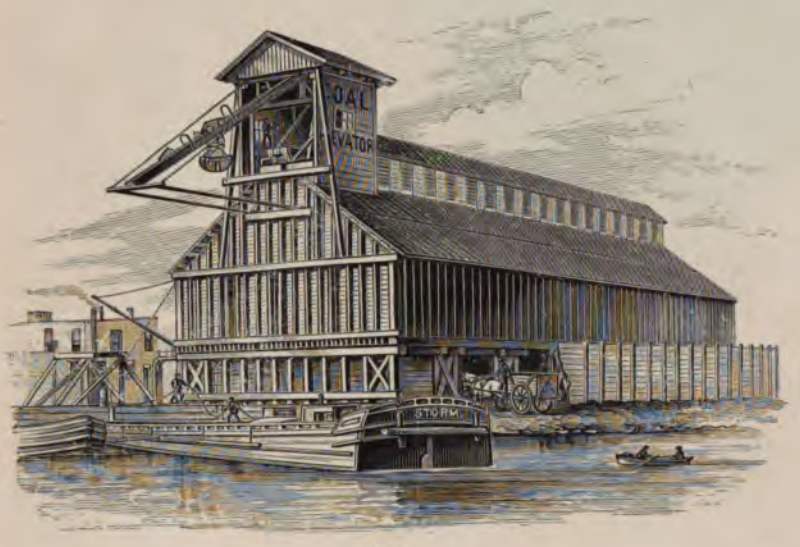
No. 10.
Connecticut Asylum for Insane, Middletown, N. Y.

No. 9.
Municipal Gas Light Co., New York City.

COAL STORAGE BUILDINGS.

We make detail plans and specifications for all classes of Coal, Phosphate, Rock and Ore Buildings. Also wharf and piling plans.

COAL POCKETS AND STORAGE SHEDS.



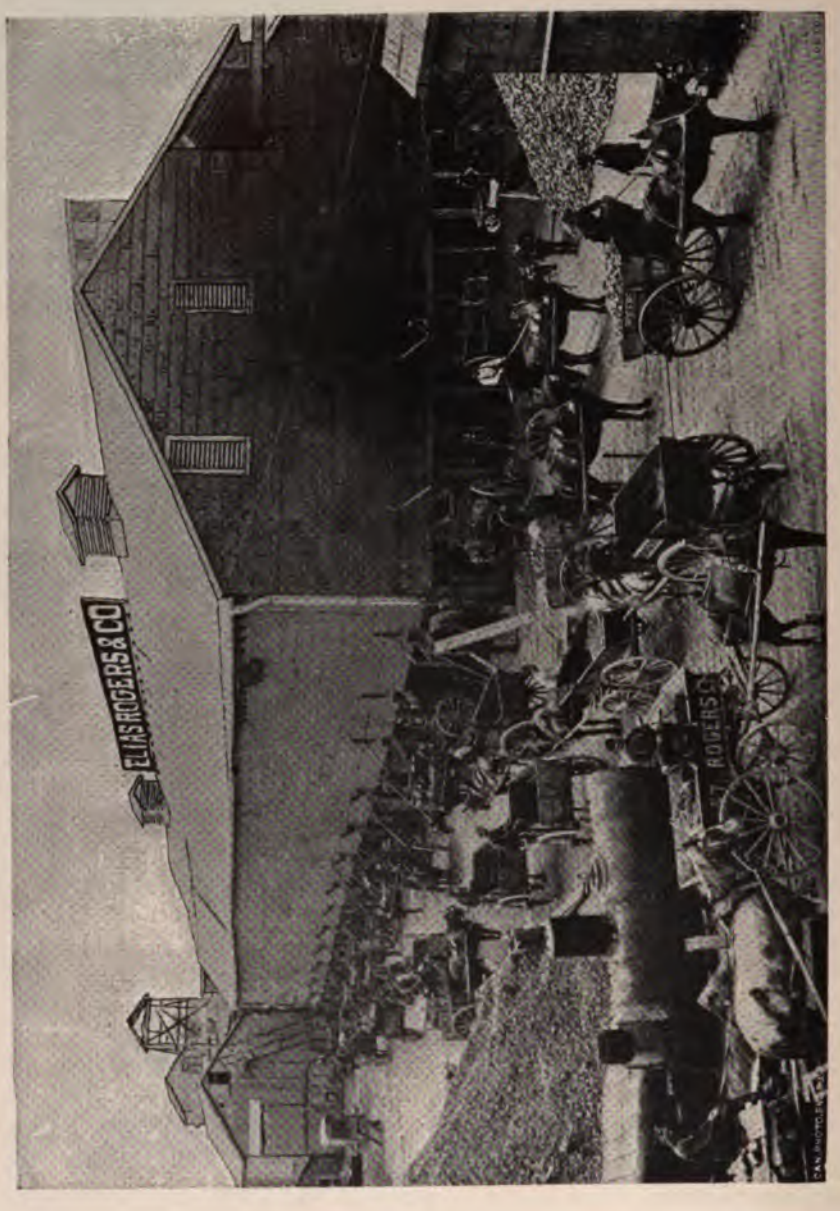
No. 1.

Coal Pocket holding 3,000 tons of Coal.

COAL dealers know, by experience, that great strength is required in the timber-work in bins or sheds for storing coal. To get this strength so that there will be no pressing out of the sides of the bin and at the same time not put in an excessive amount of timber, it is an important matter both in the first cost and in the maintenance afterwards, that the most approved plan should be adopted.

Since 1873, we have made plans for a great many coal buildings of various kinds that have been built in different parts of the country, and as a result of our experience and observation of this class of buildings, believe that certain methods of construction are better and also cheaper than the usual ones adopted by carpenters and builders, and we have adopted them in our designs. A great economy in the timber-work can be made by proportioning the size of each timber to the strain it has to bear, and where piles are used to so space them that each gets an equal load. Timber-work to be durable should have a breaking strength of at least eight times the amount of the permanent load upon it, and especial pains taken that it is not weakened in framing. Every piece should be framed so that in case of need it can be taken out and a new one inserted without disturbing other timbers, and if possible, should have a circulation of air so as to prevent decay.

Another point that should be carefully considered in the construction of the building is the location of the chutes for drawing the coal into the carts; they should be located in the most convenient position for use, and in such a way that no timbers need be cut away to make room for them, and so that the coal will be as completely drawn from the pocket as it is possible to do; the chutes most suitable for Anthracite coal are shown elsewhere. Bituminous

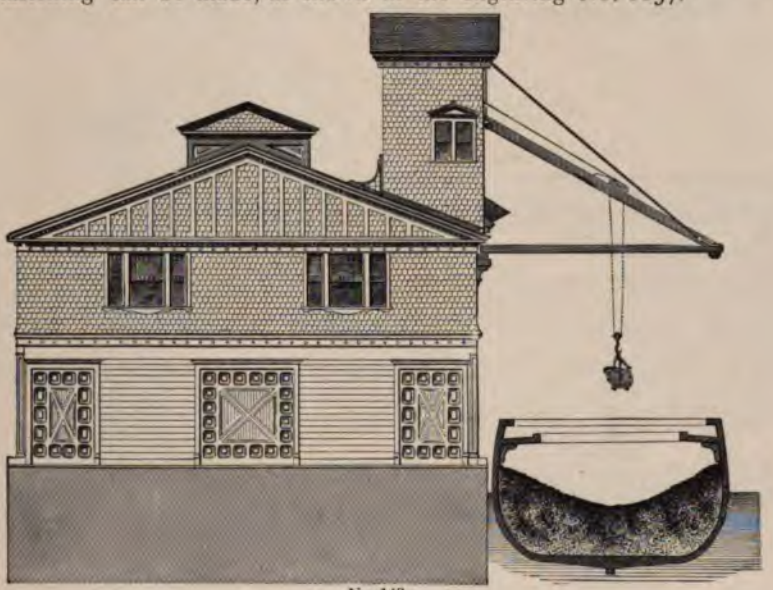


No. 1317.

Elias Rogers & Co., Toronto, Canada. Fitted with Hunt Machinery.

coal requires a very much larger opening, and cannot in any case be made to run as freely as Anthracite.

In tying the sides of buildings together, we have for many years used timber instead of iron rods, believing it to be very much better and also cheaper. Where rods are used, they bend down as the coal settles. Another difficulty is that in warm weather the rod expands with the heat and permits the sides of the coal bin to spring outward ; then a lower temperature will contract the iron and as the coal is too rigid to press upward the bolt either breaks or the bolt-head settles into the wood, as may be seen in almost any building tied together with iron rods. The use of timber entirely obviates both these troubles, and is less expensive. By placing the tie-timbers edgewise they will not break by the settling of the coal and a very secure fastening can be made, as shown in the engraving No. 1037.



No. 143.

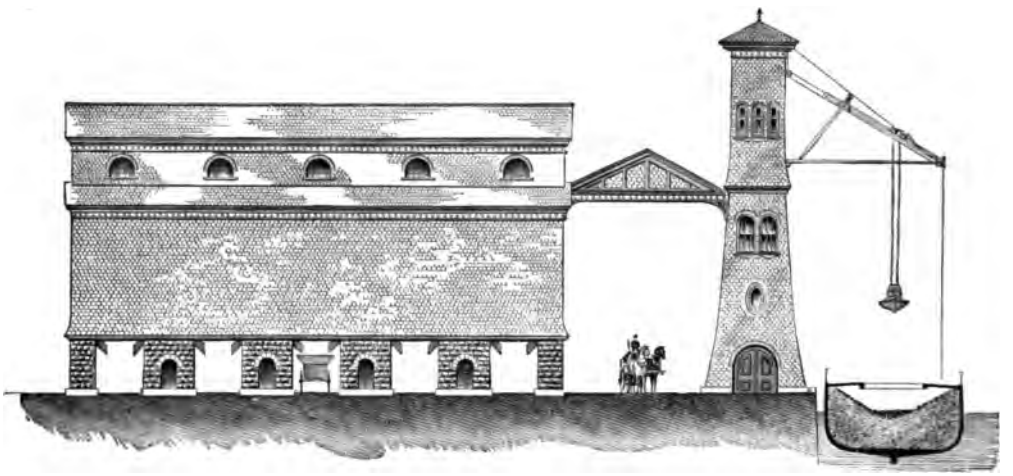
Elevator, erected on the Jewell Milling Co., Brooklyn, N. Y., some time after the building was built and the Elevator finished, to correspond with the building.

We have never known a fastening of this kind either to give way or show signs of weakness. Another feature in the plans of our coal pockets is that the posts do not run up through the pocket, even at the corners. The posts are short and capped with long timbers and the superstructure erected on these as upon a foundation. This permits any timber in the building to be removed in case of decay, without disturbing the others. This also permits the use of short timber, that costs less per thousand. We have designed large coal pockets where, for special reasons, there was no piece over six inches thick, or longer than sixteen feet.

Where coal is received and delivered immediately, the advantage of coal pockets high enough to spout the coal directly into the carts is very great, as it effects a saving in the time in loading carts and wagons of about twenty minutes to a ton, and at the same time screening the coal better than it can be done by hand and depositing the pea and dust in a receptacle between the posts to be removed at leisure. A far greater amount of business can be done on the same area, and less yard men are required. In the vicinity of New York the capacity

of the pockets is about one-tenth the yearly sales. The more frequently coal is received the smaller can be the size of the pocket in proportion to the annual sales. It is not usually economical to store coal in a pocket, as the interest on the cost and the depreciation of the pocket amounts to over twenty cents per ton for one year.

Coal pockets holding from a thousand to four thousand tons require 70 to 80 feet of lumber, board measure, for each ton capacity. By adding to the cost of the lumber twelve or fourteen dollars per thousand feet for the carpenter work, a very close estimate of the cost of a coal pocket can be made; to this must be added the cost of the foundation and the coal handling machinery. The cost of storage sheds is from fifty cents to one dollar and a quarter for each square foot of ground covered. Storage sheds require special designs to suit different locations and materials to be stored. Several examples are given in the illustrations following; some of these cover as much as five acres.



No. 142.

Elevator, Automatic Railway, Steam-Shovel and Coal Pocket, covered and finished in an ornamental manner. The frame-work and working parts are exactly the same as though they were not covered.

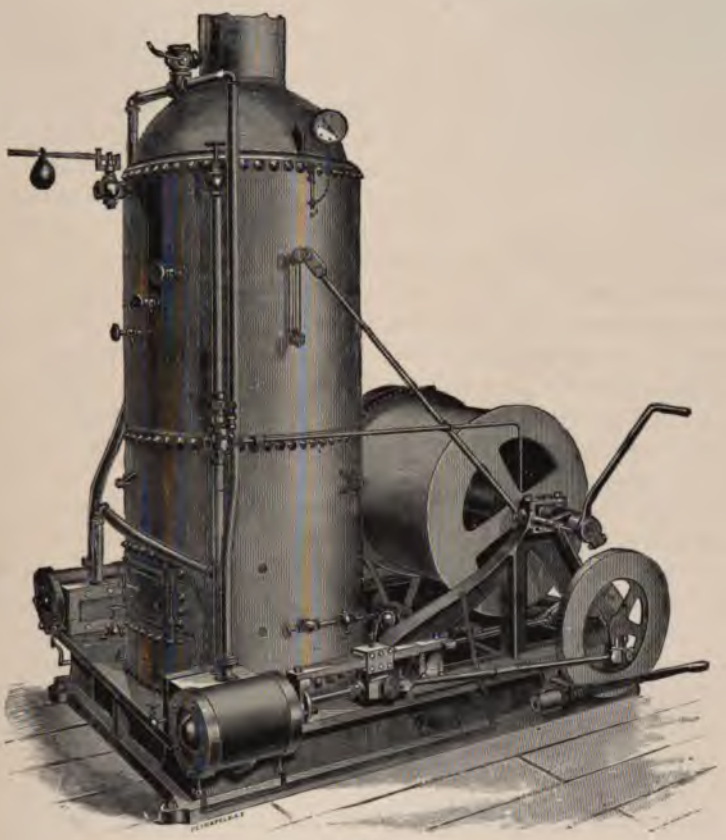
Many advantages of a coal pocket can be had by building a tunnel (shown in cut No. 79) in the yard or storage shed. A cart drives in the tunnel, a valve is opened and the coal runs into the cart over a screen until loaded, in the same manner as in a pocket. It answers all the purposes of a coal pocket for all coal higher than the top of the valve in the tunnel; the coal below must be screened and loaded in the usual way. Many of these have been built and work economically, costing very much less to construct than a coal pocket. In addition to the timber needed for the building there will be needed about three hundred and fifty feet of lumber for each foot in length of tunnel.

We furnish to parties who think of erecting coal pockets, storage sheds or wharves and foundations, preliminary plans without charge; but when more detailed building plans or specifications are needed, we make a reasonable charge for the time consumed in preparing them.

HUNT RAPID HOISTING ENGINE

ON THE

BED PLATE WITH THE BOILER.



No. 1001.

This arrangement has advantages in some cases, as the piping is all connected so that engine is ready to run as soon as set in position. This engine is the same as cut No. 5, but having a bed plate large enough to take the boiler.

When the space is not limited we recommend that the boiler be set a few feet away from engine instead of on the same bed plate, as there is less trouble from ashes flying on the working parts of the engine.

ENGINES AND BOILERS.

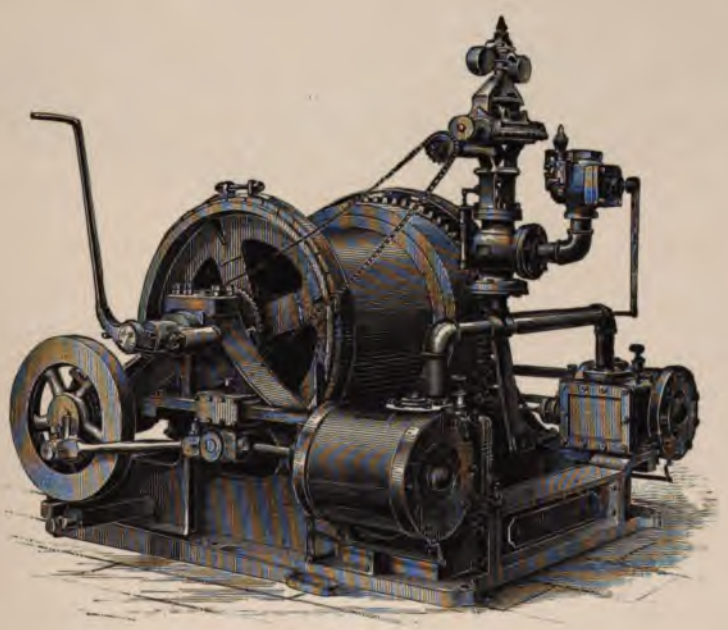
The increase in power of hoisting engines has kept pace with the increase in the size of the tubs and the speed of discharging vessels. At first engines were small, having but one cylinder, 5 or 6 inches in diameter; now our regular coal-hoisting engine is five times as large, having two cylinders 8¼ inches in diameter, and our steam-shovel engine eight times as large, having two cylinders, each 10 inches in diameter. This increase in the size of the engine takes no more steam to hoist a ton of coal than the small one did, but it hoists it more rapidly, permitting more coal to be hoisted in a day. An engine that is abundantly able to do this work is more durable and more free from trouble in the bearings and the steam-joints. In the earlier engines, the drum upon which the rope wound was quite small, but it was found that when the rope had wound up on the drum in one layer and mounted to commence a second layer, that the chafing of the rope made it fail at this point; for this reason we have enlarged the drums of our engines until they are 34 inches in diameter and long enough to wind up 150 feet of 4½-inch rope in one layer.

For rapid and economical work, the engines lower the bucket by friction, the engine standing still while the bucket is descending. In case of any injury to the friction clutch, a brake is also added, which the workman operates by his foot. This is only used to hold the bucket in mid air or when the friction from some accident fails to hold. Our hoisting engines are fitted with this brake, and friction clutch and an improved throttle valve, all the levers being so arranged that they are convenient for the engineer to operate either while watching his bucket in hoisting or lowering. The levers can also be extended to have the engineer located so that he can see every part of the work he is doing.

Our Steam-Shovel hoisting engine is fitted with a special governor that runs it fast when the bucket rises vertically from the boat, slows the engine when it reaches the booms, runs it fast up the booms and slows up to dump. This is done automatically while the engineer has the throttle wide open. The object of this is to increase the speed of hoisting as well as for safety, by reducing the constant strain on the nerves of the engineer. He hoists with the throttle wide open, paying no attention to it except when the shovel is started from the hold of the vessel, throwing the throttle wide open, the governor taking care of the speed entirely until the shovel is dumped He cannot by any possibility run the engine at an excessive speed when the shovel reaches the boom or when it is dumping. He could turn his back on the engine when hoisting at full speed, with the throttle wide open, as it needs no attention until the shovel has dumped in the top of the elevator. In case of necessity, an ordinary laborer could run the engine fairly well. This governor differs from the ordinary governors, as they are intended to run the engine at a regular speed, while this one runs the engine at an irregular speed.

No. 1135.

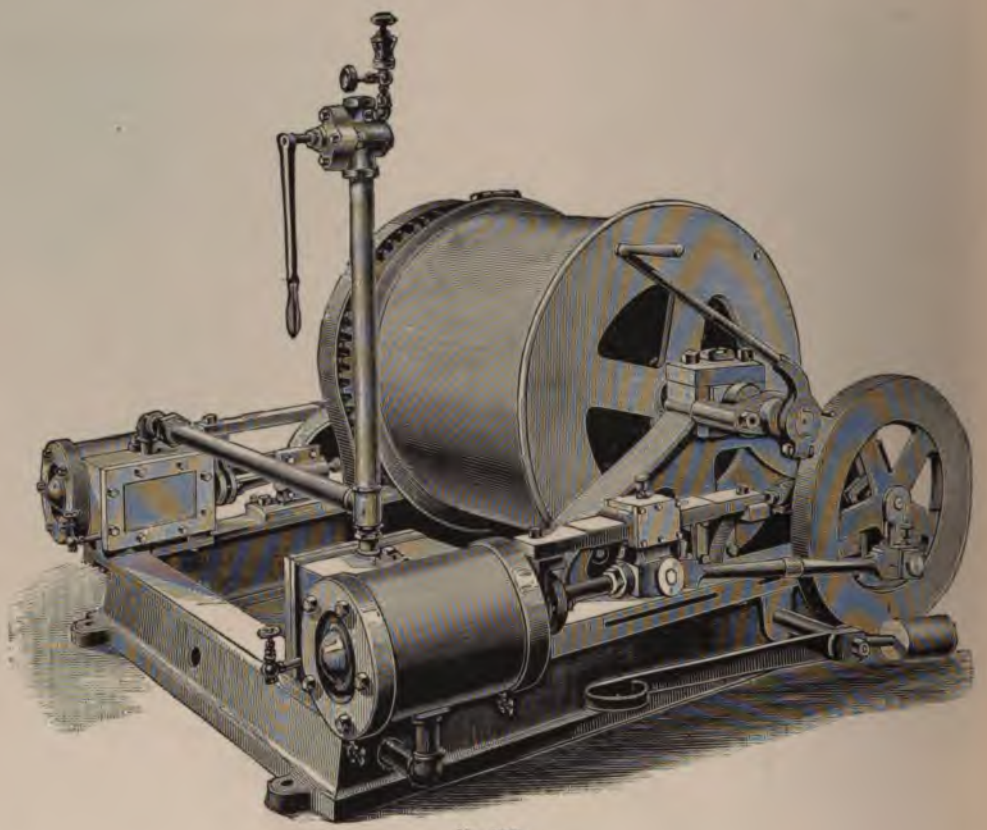
No. 1133.



No. 1127.

Double Cylinder Hoisting Engine for the Hunt Steam Shovel, fitted with governor complete.

Engine shown in Illustration No. 1127 is an extra heavy engine, used for constant and rapid work, with a load of 3000 lbs. on the chain. One of these engines has, with the steam shovel, hoisted one hundred and twenty-five tons, 107 feet high in $1\frac{1}{4}$ hours.



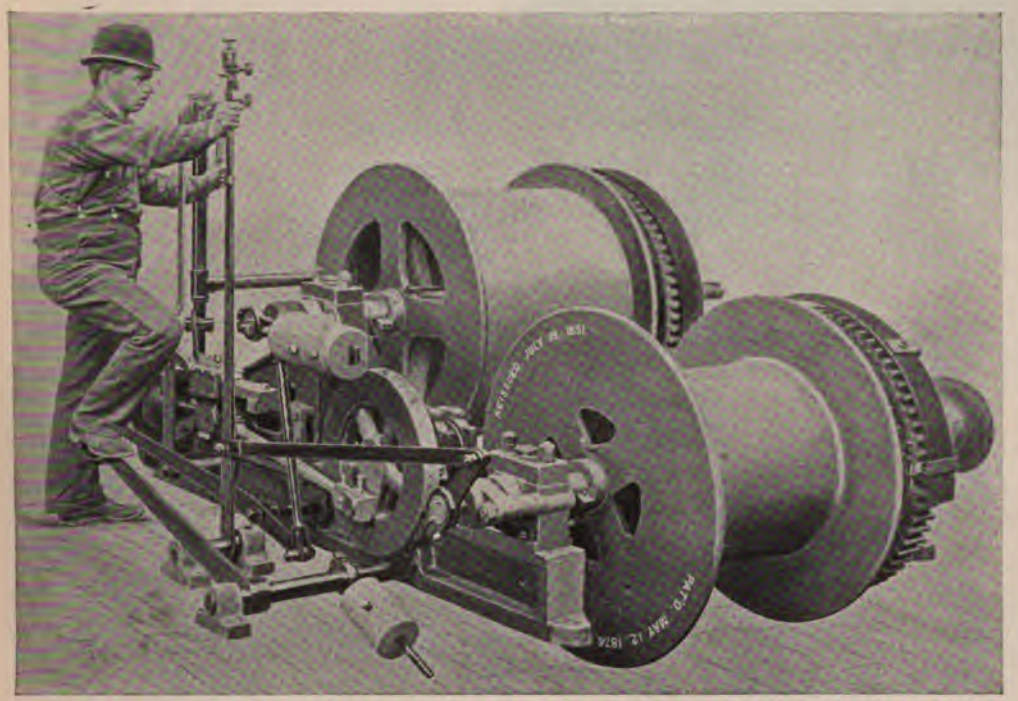
No. 1335.
Hunt Rapid Hoisting Engine.

Double cylinders with friction clutch and brake. The drum is 34 inches in diameter to wind up 150 feet of 4½ inch hoisting rope in one layer, and at a speed of 500 feet per minute. When the drum is small the rope winds up in two layers and at the end of the drum where the rope wedges against the end of the drum to mount up on the first layer, the rope is injured and fails at this point before being worn out over the sheaves.

When this engine is used on the Hunt Elevator it is in many cases more convenient for the workman to stand several feet from the engine in order to see the workmen on the vessel. In such cases we furnish extension levers arranged so that the operator stands with his back to the engine.

Actual horse power for double cylinder engine 70 lbs. boiler pressure.	Weight hoisted with single rope at usual speed.	Cylinder.		Rope Drum.		Prices.		
		Diameter inches.	Stroke inches.	Diameter inches.	Length inches.	Without boiler.	Without boiler but with extension levers.	With boiler.
25	1000	7	10	34	27	$875.00	$900	$1550.00
35	2000	8¼	10	34	27	900.00	930	1600.00
45	2500	9	10	34	27	950.00	980	1650.00

Extension levers $30 extra.



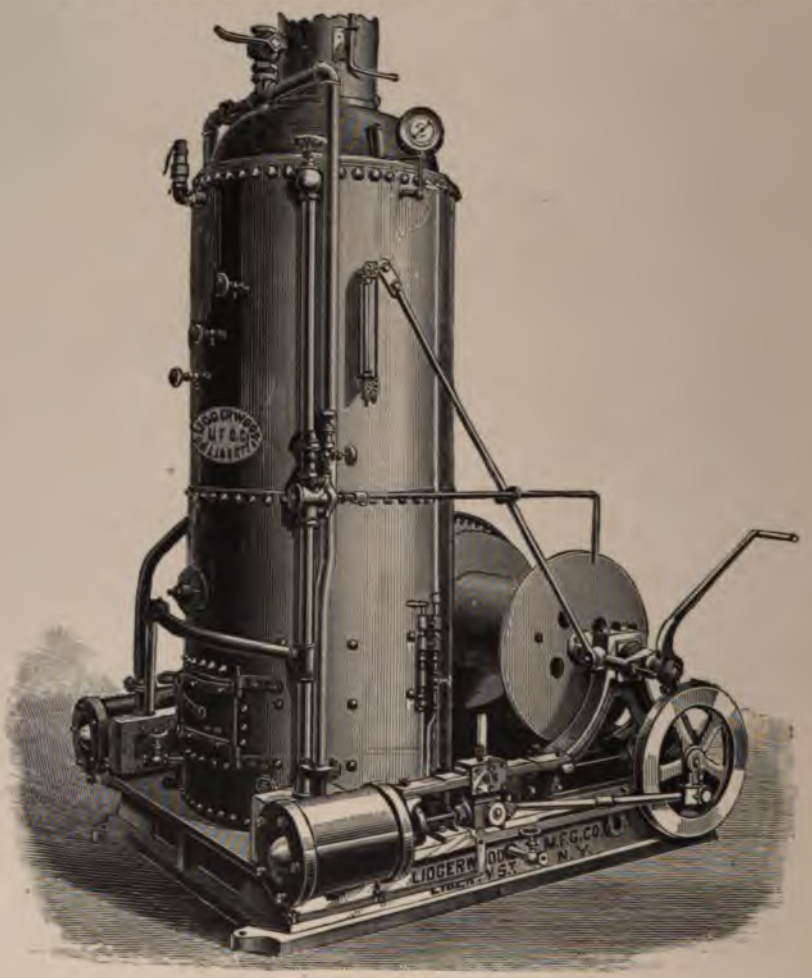
No. 1418.

Double cylinder, double drum, link motion, reversible Engine, for running our overhead Transfer, using two ropes. The drums are independent in action, and each one is fitted with a friction clutch and brake. The diameter of the drums can be changed to suit the work to be done.

HEAVY DOUBLE CYLINDER, DOUBLE DRUM, ENGINE.

Dimensions of the Cylinders.		Dimensions of the Rope Drum.				Gearing.	Price List.		
		Lower or Hoisting Drum		Upper or Running Drum			Engine Complete.		
Diameter inches.	Stroke inches.	Diameter inches.	Length inches.	Diameter inches.	Length inches.	Proportions.	Without link motion.	With link motion.	With link motion and extens'n levers Cut 1418.
6½	8	14	16	14	16		$ 775	$ 850	$ 870
6¾	8	24	27	24	27	3 to 1	1050	1125	1145
7	10	24	27	34	27	3 to 1	1275	1350	1380
8¼	10	24	27	34	27	3 to 1	1350	1425	1455
10	10	34	27	34	27	4 to 1	1650	1725	1760
12	10	34	27	34	27	4 to 1	1800	1880	1920

PORTABLE HOISTING ENGINE.

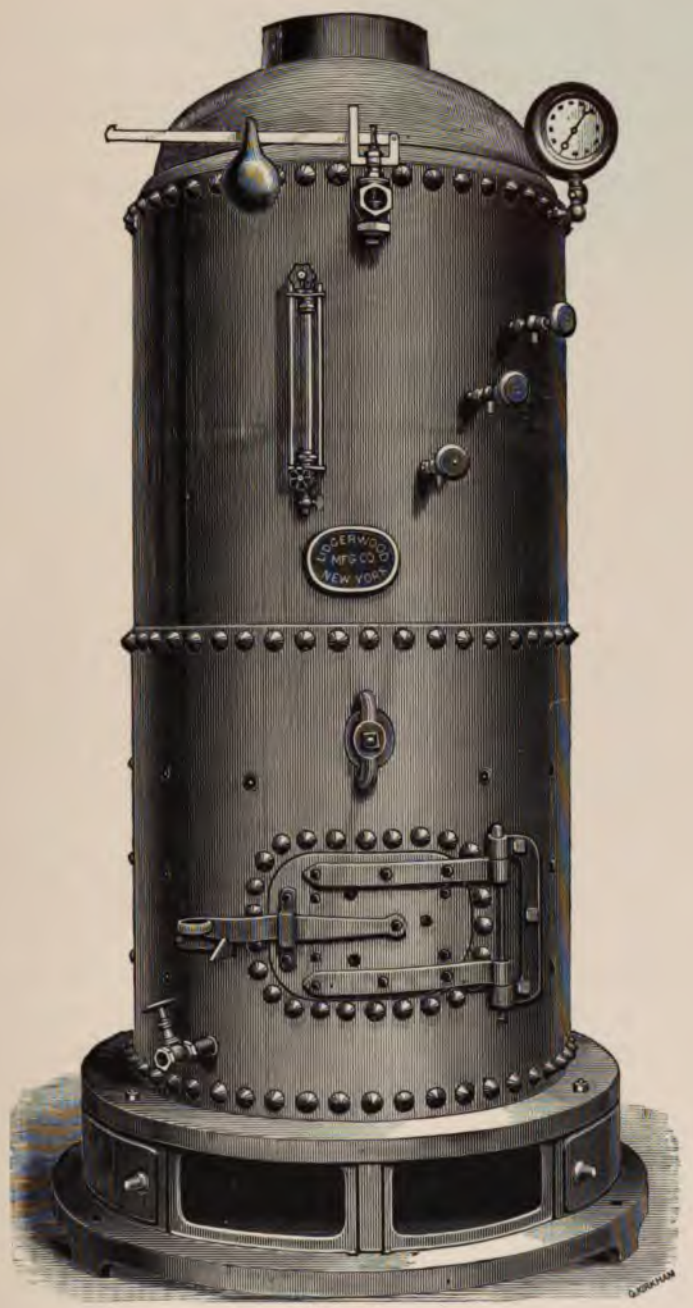


No. 1338.

This style of hoisting engine is made either with single or double cylinders, and is adapted to general hoisting, pile driving, quarries and contractors' work.

Weight hoisted with single rope at usual speed.	Cylinder.		Rope Drum.		Boiler.		Double Cylinder Engine with boiler.		Single Cylinder Engine with boiler.		Double Cylinder Engine without Boiler.
	Diam. inches.	Stroke inches.	Diam. inches.	Length inches.	Diam. inches.	Height of shell inches.	With foot brake.	With brake and reversible link motion.	With foot brake.	With brake and reversible link motion.	With foot brake.
2000	5	8	12	22	32	75	$ 950.00	$1000.00	$ 650.00	$ 720.00	$525.00
3000	6¼	8	14	22	36	75	1050.00	1160.00	700.00	780.00	575.00
5000	7	10	14	22	40	84	1325.00	1400.00	850.00	940.00	675.00
8000	8¼	10	14	24	42	90	1500.00	1600.00	1075.00	1180.00	775.00

Mounted on wheels for use on wharves, $60 extra.



No. 1336.

It is not to be expected that a small vertical boiler will equal in economy the resul of a larger one, but when the same amount of heating surface per horse-power is allowe and the shell carefully covered with a non-conducting material, the difference in econom is small.

We append below a list giving the horse-power, size, and price of Upright Boiler, th price covering all fixtures, including an Injector and twelve feet of Smoke-pipe.

TABLE OF SIZES AND PRICES.

Horse-power.	Diameter of Boiler, in inches.	Height of Boiler, in inches.	Price of Boiler, with all fixtures complete including Injector and 12 ft. of Smoke-pipe.
5½	28	63	$224.00
6½	28	69	239.00
7½	30	72	266.00
8½	32	75	299.00
10	34	78	320.00
11	36	75	341.00
12	36	81	357.00
13	38	81	388.00
15	40	75	413.00
17	40	84	429.00
21	42	90	455.00
29	48	96	560.00
31	48	102	614.00
35	50	102	665.00
40	50	114	692.00
40	53	102	765.00
50	53	120	800.00
60	60	120	957.00

No. 93044.

STEEL COAL TUBS.

KEPT IN STOCK.

1116

The Tubs shown by the engravings are intended for hoisting coal from vessels, the coal being shoveled into them by the workmen. They are so hung that they are top-heavy when filled, and bottom-heavy when empty, consequently, when the catch is unfastened the full tub tips over, the load runs out, and it then immediately tips back to its upright position and the catch fastens itself by gravity. These tubs are in almost universal use for hoisting coal, sand, stone and other bulky materials. The form is the result of long experience in building this class of machinery. In handling anthracite coal they are tipped forward and shoved up against the side of the pile, the workmen then scrape the coal from the pile in front, into the bucket, so that it is one-half to three-quarters full. The form of the bucket is such that when it has been filled this much it nearly balances on the front wheels and is easily tipped to an upright position. The workmen then shovel the scattered coal into the bucket which fills it, when it is ready to hoist. The wheels on the bucket make it run easily to the hatch as the face of the pile of coal retreats. These buckets have two styles of fastenings, one for use on the elevator that automatically dumps it when it reaches the top of the booms, called back-lever catch, and the other called a side catch, that is thrown out by hand. The position of this catch and the handles on the tub is such that when the workman takes hold of the bucket to steady it, his thumb is under the latch that trips it, making it the most convenient possible position. The tub stands on three wheels all rigidly set. For large tubs it is sometimes more convenient to have one wheelswivel to facilitate turning the tub. We make them when ordered without extra charge.

Our tubs are made of the best plate steel, and in the best manner, with large wheels, extra wide and flat face, and either "side catch" or "back lever," as may be ordered. They are also made with double bottom for stone, extra heavy stock for iron ore, and with automatic-catch for dumping in a hopper with Hunt's Elevator. We are prepared to make to order tubs of any size or shape, or of any thickness of steel that may be ordered.

Made with either rigid or swivel wheel at back as ordered. Unless otherwise ordered rigid wheel will be sent.

No. 1302.
Tub for Coal, with Side Catch.

No. 1146.
Tub for Coal, with Back Lever Fastening.

manufacture a tub especially for coaling locomotives, that dumps from the bottom. is square and divided vertically with a hinge near the top. The bottom is inclined y from the opening, so that when the catch is unfastened, the coal runs entirely out. antage of this tub is that as the coal falls out of the bottom, the fireman can swing ket exactly where he wishes the coal, and when the bucket is tripped it will fall y and with the least danger of rolling over the edge of the tender. The height of ket over the coal in tender when dumping is lower than any other style, as it is only y to have the bottom of the bucket as high as the top of the coal will be when l. We make these buckets in two sizes, ½ ton and one ton.

No. 1082.
Locomotive Coaling Tub.

No. 1310.
Clay Tub.

No. 1028.
Back Lever.

No. 1022.
Side Catch.

No. 1020.
Back Lever.

Capacity of Tubs.	Coal Tubs. See Cuts No. 1302 " 1146 "	Ore Tubs. Same appearance as Coal Tubs.	Clay Tubs. See Cut No. 1310	Locomotive Coaling Tubs. See Cut No. 1082
¼ ton gross.				
½ " "				
¾ " "				
1 " "				
1½ " "				
1½ " net.				
1½ " gross.				
1,500 lbs.				
2,000 "				

Discount.....

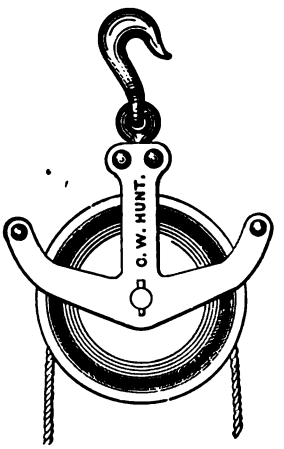
Our tubs are made of the best plate steel, with large wheels, extra wide and flat on the face, and either "side catch" or back lever, as may be ordered. They are also made with extra heavy stock, and double bottom, for iron and stone. In ordering, please specify whether "Side Catch Tubs," No. 1022, or "Back Lever," No. 1020, are wanted.

For prices of our coal tubs, please write us, stating material to be handled, size or cubic capacity, power for hoisting, and whether side catch or back lever fastening.

HOISTING BLOCKS.

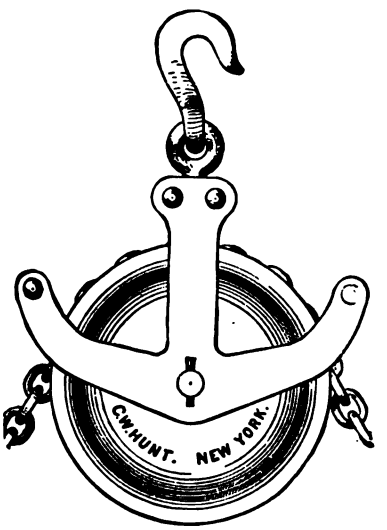
No. 1065.

Block for Manila Rope.



No. 1048.

Block for Wire Rope.



No. 1069.

Block for Chain.

We make three styles of Hoisting Blocks:

1st.—Hoisting Blocks for rapid hoisting, with manila rope, usually used for unloading vessels carrying Coal, Ore, Gypsum and similar materials.

2nd.—Heavy Iron Blocks for Wire Rope, usually used in Quarries, Derricks, and places where the load is heavy but the motions slow.

3rd.—Iron Blocks with the Sheaves grooved for chain.

Each Class will be described under a separate head as the work required of each is different and they are very unlike in detail. There are some general principles which apply to all Blocks, and these should be carefully borne in mind in each style. As the Block will wear out many ropes, it is advisable to arrange every part in reference to the least possible wear of the rope even at an increased first cost of the Block. As Blocks are used in almost every position, good and bad, they should, as far as possible, be made to adjust themselves in line with the rope. If the rope is not accurately in line it will run to one side of the Block wearing both the rope and the sheave as well as requiring more power to do the work. The larger the sheave is in diameter the less the number of revolutions it has to make to do a specified amount of work. There will be less wear on the pin, and the rope will suffer less, as it is not only bent to a less degree, but the slipping of the fibres on each other is less rapid. All Blocks should be fitted with a Hook, an Eye, and a Swivel, or a universal Joint to permit them to adjust themselves in line with the Hoisting Rope.

FOR DESCRIPTION OF WIRE ROPE BLOCKS SEE CATALOGUE "WIRE ROPES."

HOISTING BLOCKS FOR MANILA ROPE.

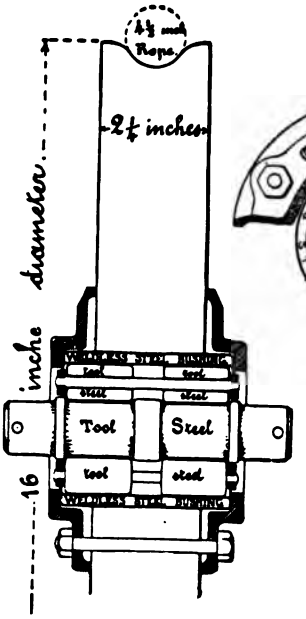
No 1015.

THESE blocks are designed to be of the highest excellence in every respect, both in materials and workmanship, and to cause the least possible wear on the hoisting rope. To insure this, the sheaves are made of Lignum-vitæ and exceptionally large, the diameter being 16 inches, by far the largest ever put on the market.

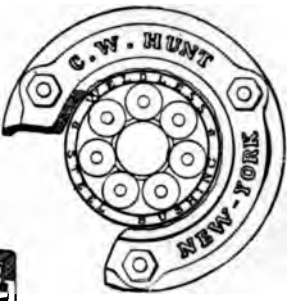
It is the opinion of nearly all who have had experience in the wear of ropes, that the least injury to the hoisting rope is attained by the use of Lignum-vitæ for the sheaves of the blocks. Our sheaves are made of San Domingo Lignumvitæ, 16 inches in diameter, 2¼ inches thick. There is nothing better than an oiled bearing, but it is only a question of time in rapid hoisting, when the oiling will be neglected, and an hour's work in this condition destroys the sheave or the pin. Any arrangement for self-oiling will ultimately fail, because the better it is the more certainly it will be forgotten, especially when put up forty or fifty feet in the air with no convenient way of getting at it; for this reason we use roller bearings exclusively on this class of blocks, fitting them with a patent roller bearing 4 inches long, with 14 tool steel rollers, and a tool steel pin, both hardened in oil. The shell in which the roller is placed is a weldless steel ring. The great thickness of the lignum-vitæ sheave leaves the edge thick to prevent pieces breaking out. The frame is made wide enough to take in a six-inch circumference rope, or a four and a half inch rope with a short splice. The sides are made so that the rope will not cut if accidentally drawn over the sides in starting. To make the block hang so that the rope will "lead fair," an eye with a swivel is put between the hook and the frame.

To prevent chafing and rapid wear on the outside of the rope it is very important

No. 91.



Cross-Section of the Sheave and Bearing.



No. 1041.

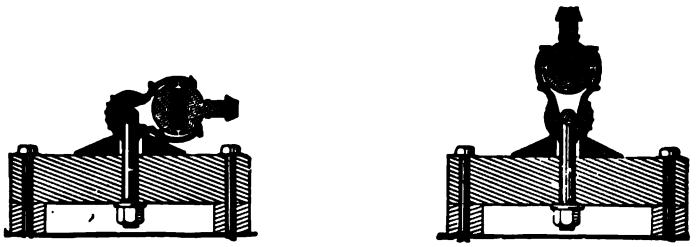
PATENT BUSHING

14 tool steel rollers, 7 at each end, steel pin, steel bushing.

block shall hang exactly in line with the direction the rope "leads," if it does not uns on one side and wears both itself and the block. Blocks are frequently placed position that the strain of a rope is upward; an ordinary block would fall over ope is slackened; for this work we furnish a class that are usually called dock blocks. es and frames are the same as those previously described, but in place of a hook, a is used. This ball joint permits the block to move in any direction that the rope spring in the ball causes enough friction on the shell to hold the block in position rope slackens. If the rope leads in another direction, the ball slips and allows the llow; the spring is adjustable to get any required tension. These ball joints are made ms; one having a screw thread especially formed for screwing into a wooden dock d of the right size for a 1½-inch augur hole. The other form is intended to bolt to the ers direct, or to a piece of plank 3 inches thick, which can be fastened to the dock ce of two or three inches between to get at the nut. The shell of this ball joint sets base and can be adjusted to any position from vertical to horizontal. For use, set ır as possible in the direction the block will stand and when the strain of the rope ıe block will then adjust itself to the exact direction the rope "leads," by the slip- e ball joint. To adjust the amount of friction, slacken the screw on the outside of and screw the shell on or off the standing part as may be needed, then draw up ew to hold it permanently in position.

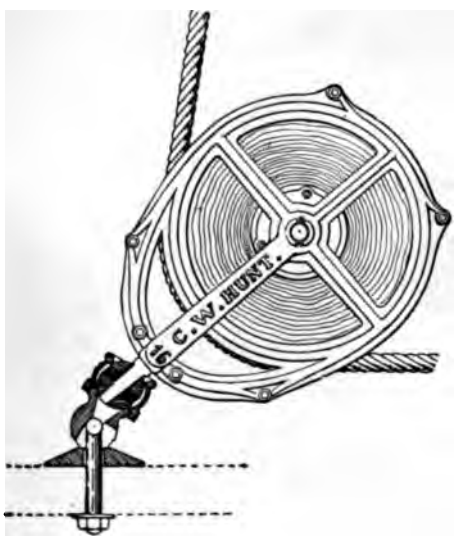
DOCK BLOCKS FOR MANILA ROPE.

ALWAYS IN STOCK.



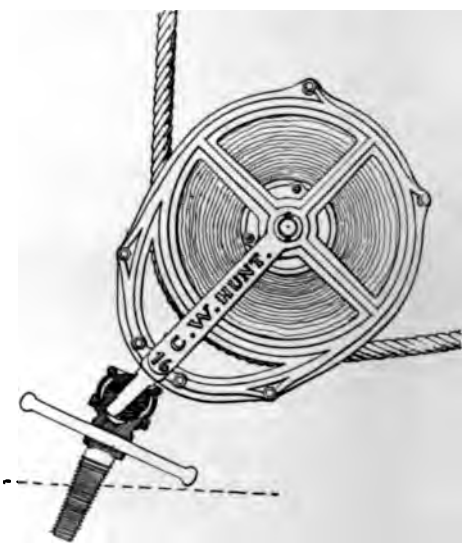
No. 1055.

Cross Section of the Bolt Dock Ball Joint in Different Positions.



No. 1043.

Bolt Dock Block.



No. 1003.

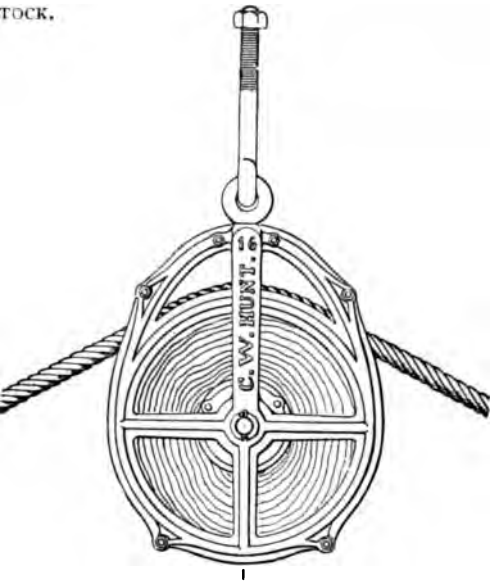
Screw Dock Block.

These Blocks have a Lignum-vitæ Sheave 16 inches in diameter and $2\frac{1}{4}$ inches thick, with Patent Roller Bearings 4 inches long. The Pin is $1\frac{1}{8}$ inches diameter, oil-tempered tool steel. There are two sets of Rollers, 7 in each set, of tempered steel. The Blocks have a hook, eye and swivel to adjust themselves accurately in line with the hoisting rope.

HOISTING BLOCKS FOR MANILA ROPE.

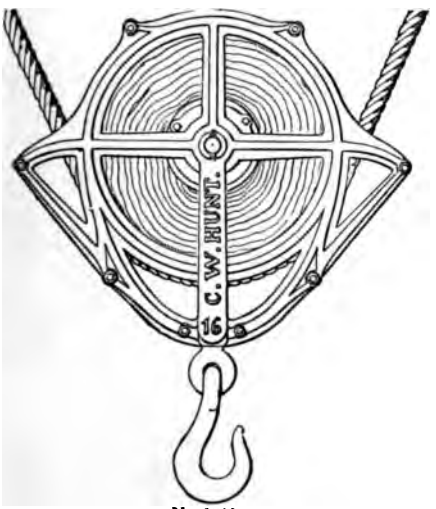
ALWAYS IN STOCK.

No. 1065.
16-inch Sheave Hook Block.

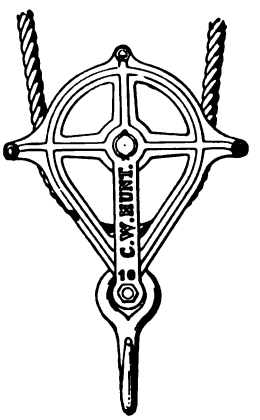


No. 1044.
16-inch Sheave Throat Block.

We make but one diameter of sheaves for hook and throat blocks.



No. 1042.
16-inch Sheave Running Block.

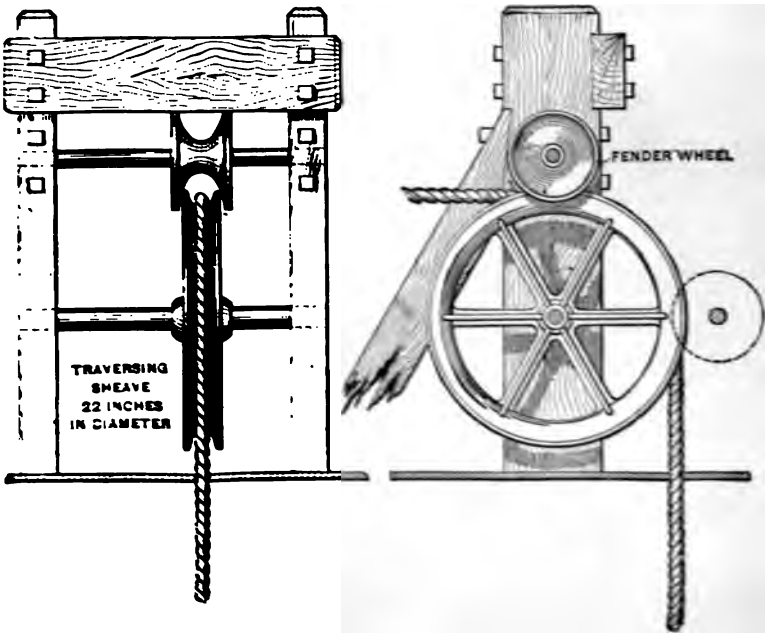


No. 1045.
10-inch Sheave Running Block.

No. 1051.
Elevator Tube Block. For use on Hunt's Patent Elevator.

We manufacture two sizes of running blocks, 16 inches and 10 inches diameter of sheaves, each having patent roller bearings and lignum-vitæ sheaves. The elevator tube block is a special one used only on Hunt's Coal Elevators.

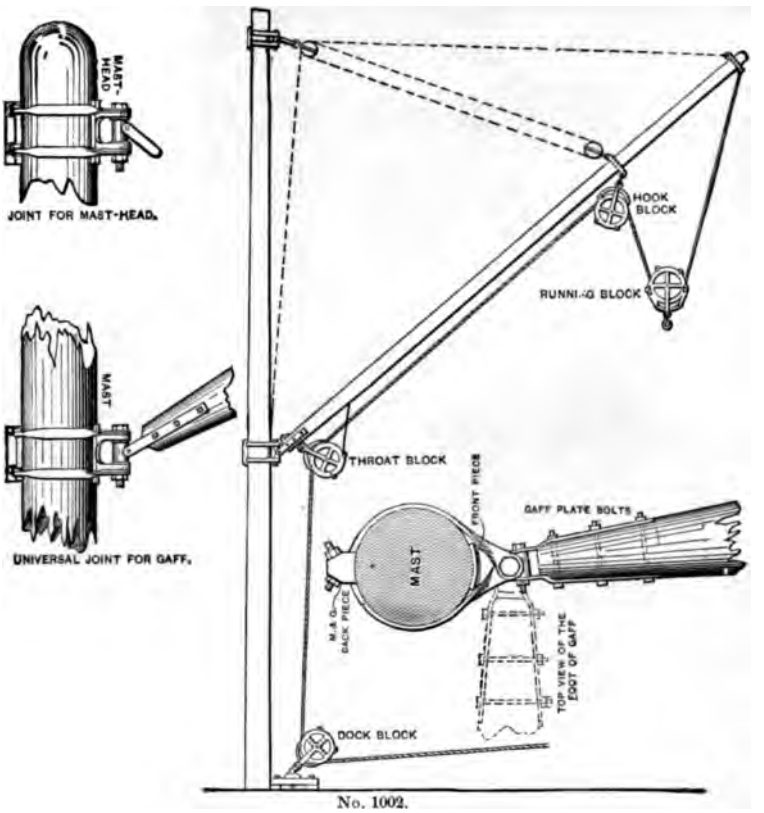
Running blocks are liable to tip over when the load is taken off from them, for this reason they have guides placed on the sides in such a position that they cannot tip over when unhooked from the load. We make two sizes of these blocks: one 16-inch sheave for steam hoisting, and one 10-inch sheave for horse hoisting, where it is necessary to have a light block for convenience in handling. The small sheave wears the rope faster than a large one, but the durability of the rope is sacrificed in this case for greater convenience in handling the block.



No. 1008

Traversing Sheave and Fender Wheel.
Weight, 175 lbs.

Another style of sheave is frequently needed for leading the rope to the hoisting drum of an engine; as the rope winds on the drum of the hoisting engine it moves sideways, and, with an ordinary block hooked in a fixed position, draws sideways and unless the lead is very long the rope chafes on the coils previously wound. In such case the traversing sheave should be used. Our regular sheave for this work is about 22 inches in diameter, 18 inches in the score, and made of iron. It runs loose on a piece of shafting usually the same length as the drum of the hoisting engine, and runs at any point that the pull of the rope takes it as it coils upon the drum, the wheel moving sideways to a corresponding position on the shaft. To prevent the rope from falling out of the sheave when it is entirely slackened, a "fender pulley" may be put up as shown by the cuts. This sheave is also useful in leading the rope out of a straight line to avoid some obstruction.



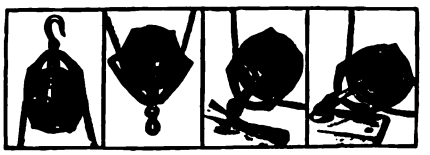
No. 1002.

In ordering blocks, use the same name as on the cut.

PRICE LIST OF BLOCKS FOR MANILA ROPE.

›k Block, Cut No.	1015 and 1065,	sheave	16	inches	diameter,	-	$24.00
oat " " "	1044, - -	"	16	"	"	- - -	24.00
ining " " "	1042, - -	"	16	"	"	- - -	24.00
" " " "	1045, - -	"	10	"	"	- - -	20.00
. Dock Block "	1043, - -	"	16	"	"	- - - -	33.00
w " " "	1003, - -	"	16	"	"	- - -	33.00
›ator Tub " "	1051, - -	"	10	"	"	- - -	22.00
versing Sheave, Cut No.	1036, -	"	22	"	"	- -	6.00
" Sheave and Shaft,	- - - - - - - - -						8.00
" " Shaft and Fender Wheel,	- - - - - - -						10.00

Discount.....



No. 92.

BLOCKS FOR WIRE ROPE.

ALWAYS IN STOCK.

No. 1010

Wire Rope Blocks with a Hook, an Eye and a Swivel, for slow work. The sizes kept in stock, are made with sheaves from 10 to 20 inches in diameter.

These blocks are intended for hoisting in quarries, foundries, and other places where the speed of the rope is comparatively slow and the load great; they are not suitable for rapid hoisting. They are made of the best materials, and unusually strong to stand rough usage. They are proportioned so as to be in every part stronger than the wire rope that runs on them, so that if an accident occurs in use, it will be by a breakage of the rope and not of the block. The sheaves have a solid web, the pin is very large, over three times the size needed for strength alone, and the bearing fitted with oil cups and very long, in order to have a large surface to bear the great strain and not press out the lubricant. The pins are turned to standard gauges, the dimensions of which are shown in the accompanying table. The nominal diameter of the sheaves in the table, is the diameter of the centre of the rope as it bends around it. As rough and irregular scores cause rapid wear in the rope, we turn the scores of these sheaves in a lathe, so that they are accurately round and exactly suit the rope that is to run over them.

We keep in stock sheaves for the above blocks which can be used in other places where wire rope sheaves are needed. The table gives the exact size of every part, to enable engineers to prepare the proper space for them. The holes are bored out and reamed to exactly the size given in the table; covered oil cups are fitted to them.

All sizes kept in stock.

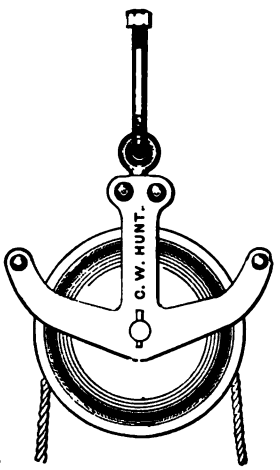
1012

The hole is bored to standard sizes and the score for the rope is turned in a lathe to run perfectly accurate and to fit the rope. The exact size of each sheave is shown in table and the smallest diameter of wire rope to use given in the table.

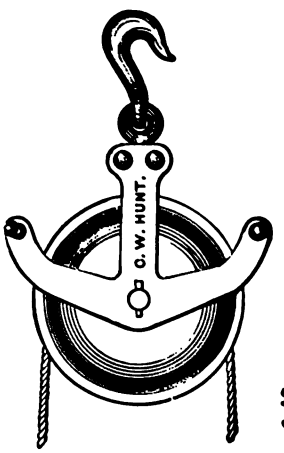
HEAVY HOISTING BLOCKS FOR WIRE ROPE.

We keep all sizes in stock from 10 in. to 20 in. in diameter of Sheave.

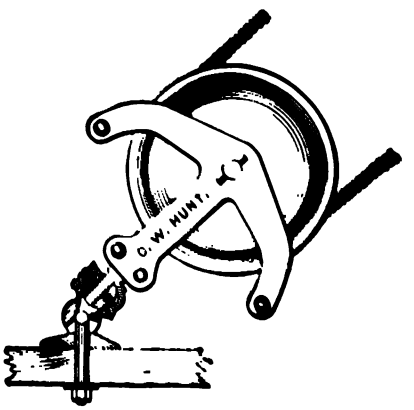
1035
Wire Rope
uble Blocks
ade to order
only.



1047
Wire Rope Throat Block.



1048
Wire Rope Hook Block.



1000
Wire Rope Bolt Dock Block.

PRICE LIST FOR BLOCKS AND SHEAVES FOR WIRE ROPE.

ALL SIZES KEPT IN STOCK.

Suitable for a wire hoisting rope.	Pitch diameter of the sheave, inches.	Diameter over flanges of the sheave, inches.	Diameter of the pin, in inches.	Length of the bearing, in inches.	Thickness of the sheaves at the rim.	Price of sheaves bored out and score turned.	Price of Steel pin for sheave, total length.	Price of Hook or Throat blocks, complete.	Price of Double blocks	Price of either Bolt or Strap Dock Block.	Price of bucket.
	10	11¼	1⅜	2 1-16	1⅝	$1.80	$1.00	$ 7.00	$10 50	$17.00	$1.50
	12	13½	1⅝	2¼	2	2.50	1.20	10 50	15.50	20.00	1 75
	14	15¾	1 11-16	2 15-16	2¼	3.80	1.40	14.50	22.00	24.00	2.50
	16	18	1 11-16	3¼	2¾	5 00	1.75	20 50	31.00		3.50
	18	20¼	1 15-16	3 9-16	3	7.50	2.00	30 00	45.00		5.00
1	20	22½	1 15-16	3 15-16	3½	9 60	2.25	38.00	57 00		7.00

We furnish sheaves separate from the blocks see cut 1012 The table gives the exact dimensions of each size.
We have patterns for several irregular sizes of wire rope sheaves. Dimensions given on application.

Discount.....

CRUCIBLE STEEL WIRE ROPE,

KEPT IN STOCK.

1011

WIRE ROPE WITH EYE SPLICED IN.

1049

WIRE ROPE WITH HOOK SPLICED IN.

1039

WIRE ROPE WITH SISTER HOOKS SPLICED IN.

THE flexibility of wire ropes increases with the number of wires to a strand. The finer the wire of which the rope is made, the more wires there will be to a strand, and the smaller will be the sheave over which it can safely run. The rope that we have found the strongest and most serviceable, and which we keep on hand for our own use, is a special quality of crucible steel. The strains put upon a wire rope by our automatic railway are very severe, and only the finest quality of rope will stand this crucial test.

The elaborate and painstaking experiments by Mr. Andrew S. Biggart, member of the British Institution of Civil Engineers, undertaken to obtain data for designing the hoisting ropes and blocks for building the Forth Bridge, is the basis of the following estimate of the durability of wire rope when running over sheaves comparatively too small.

Theory based on these experiments points to a diameter of sheave, to prevent injury of the rope from bending, of about 400 times the diameter of the wire of which the rope is made, or about 150 times the diameter of a wire rope having twelve wires to a strand. This is a very much larger diameter than can be used in practice, consequently the rope will be injured by bending over the ordinary hoisting sheaves.

The wear on a wire rope usually occurs from

First. Fatigue of the metal from bending over sheaves relatively too small.

Second. Wear on the inside of the rope from the friction of the wires on each other.

Third. Wear on the outside wires.

The first is illustrated in ropes running over ordinary pulley blocks.

The second by the wear on ropes used in hoisting cages in mines.

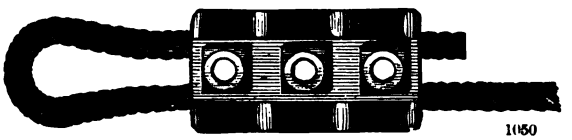
The third by the wear on street railway cables from slipping of the grips.

The most serious of these sources of destruction is the injury from the bending of the rope over the sheaves. The number of times that the rope can be bent around a sheave before breaking will vary with the diameter of the sheave. Experiments show that the probable life of a wire rope ½ inch in diameter, running over a sheave 16 inches in diameter, with a load of one-tenth of the ultimate strength would be about 160,000 bends in one direction. If the pulleys are so arranged that the rope is bent one way on one sheave and the opposite way on the other, the life of the rope will be about one-half of what it would if bent one way only. From the above it will seen that the number of sheaves over which the rope bends should be few, and arranged to bend the rope one way only, the diameter being as large as circumstances will permit.

The injury by wearing of the wires where they cross each other, if on the inside of the rope is very great if the rope runs without a lubricant. This can be reduced to a nominal amount of judicious oiling. The oil must be fluid enough to run into the interior where the wear takes place. Grease or tar is of no service whatever for this purpose. We recommend the use of a "sight feed" oil cup that can be adjusted to give a succession of drops while the rope is running, using a heavy lubricating oil similar to our "C C" oil.

The outside wear from chafing can usually be reduced by care in the finish of the score of sheaves and by proper lubrication. Sheaves filled with soft material to wear the rope less are so expensive that it is cheaper in ordinary cases to use iron sheaves, and renew the rope as needed.

We give a list of the sizes of rope which we keep in stock, ready for immediate delivery. The working load will vary according to the circumstances. When the work is very irregular and subjects the rope to shocks, a smaller load than the one given in the table should be used.



ROPE CLAMP—*see Table.*

CRUCIBLE STEEL WIRE ROPE.

Circumference or Rope in inches.	Diameter in Inches.	Smallest diameter of Sheaves.	Price per foot of Rope.	Wires to a Strand.	Approximate breaking strength in pounds.	Safe working load over Sheaves.	Price for Patent Clamp.
1¼	⅜	10	7 cts.	7	9,000	1,800	$0 95
1½	7/16	12	8 "	7	11,000	2,000	1 10
1¾	9/16	12	11 "	7	13,000	2,600	1 15
2	5/8	14	16 "	12	17,000	3,600	1 15
2¼	11/16	16	19 "	12	25,000	5,000	1 30
2½	¾	18	27 "	19	36,000	7,500	1 60
3	1	20	34 "	19	48,000	10,000	1 90

We have also given the smallest diameter sheaves over which this rope should be bent. This is for slow work, such as with hoisting blocks in stone quarries, and cranes in foundries, where the rope is not worked rapidly. For quick work, the diameter of the sheaves should be at least double that given in the table, and as much larger than that as is practicable.

We keep this rope in stock, and cut to lengths as ordered. We also splice in thimbles, hooks, or sister hooks, as may be needed.

HUNT'S HAND MADE CRANE CHAIN.

MADE TO ORDER ONLY.

No. 1340.

Crane Chain is the commercial name of an iron chain made with very short links, so that the links will not be bent in bending around drums or sheaves, and also not kink in handling. We use a chain for hoisting the steam shovel, and, as the breakage of this might cause very serious damage, we have taken unusual pains to procure the best iron that can be made, and to see that the best and most careful work is done in welding the links.

These chains are not made for the general market, but only to order for our customers who require the best material and the most careful workmanship.

Each chain is tested before shipment with a "proof" load, as noted in the following table:

CRANE CHAIN.

Diam. of iron.	Approximate breaking strength in pounds.	Chain is tested before shipment with a load of	Price per lineal foot.	Diam. of iron.	Approximate breaking strength in pounds.	Chain is tested before shipment with a load of	Price per lineal foot.
⅜ inch.	8,400	4,000 lbs.	.....	1 1/16 inch.	28,500	14,000 lbs.	.....
7/16 "	11,500	5,000 "	.....	¾ "	33,500	16,000 "	.....
½ "	15,000	7,000 "	.....	⅞ "	46,000	22,000 "	.....
9/16 "	19,000	9,000 "	.....	1 "	60,000	28,000 "	.....
⅝ "	23,500	11,000 "	.....	1⅛ "	76,000	36,000 "	

CHAIN OIL.

KEPT IN STOCK.

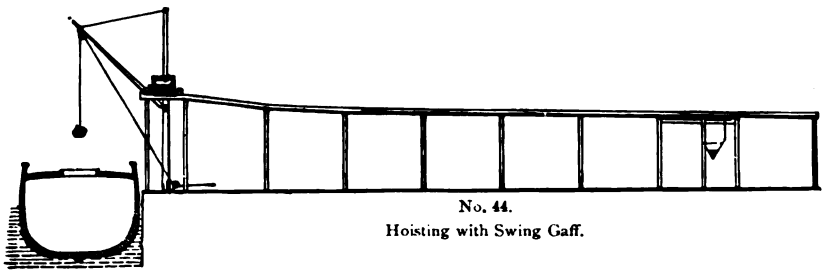
In hoisting with a chain it is necessary that it should be thoroughly lubricated and so thoroughly flooded with oil that it flows into every joint of the chain. The necessity for this is so imperative that for the benefit of our customers, as well as to have our machinery run under favorable conditions, we will supply them with an excellent quality of lubricating oil *free from grit*, with a good cold test and equal to machine oil sold in the market at a much higher price. At this low price there need be no excuse for an attempt to economize by using too little oil on the chain. It will be also a convenience to many to know just what should be used for this purpose, what it will cost and where to get it at once.

Barrels contain about 50 gallons, and as they vary but little in contents we sell this oil by the barrel only.

Price per barrel, F. O. B. New York, ... $6.00 *net.*

MAST AND GAFF.

FITTINGS ARE ALWAYS KEPT IN STOCK.

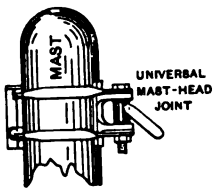


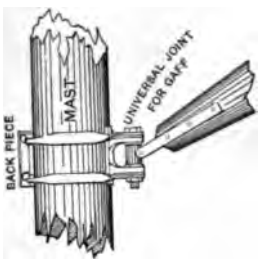
No. 44.
Hoisting with Swing Gaff.

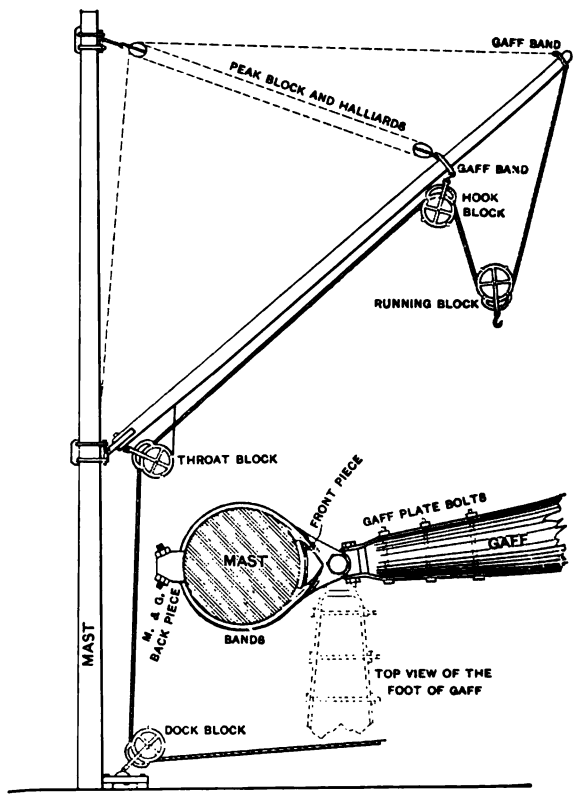
A MAST AND GAFF is one of the best methods of hoisting when the hoist is comparatively small, and the weight is not too heavy. It is used more than any other method in transferring from canal boats into carts, using tubs holding 1-5th to 1-6th of a ton when hoisting with a horse, and 1-4th to 1-3d of a ton when hoisting with an engine. While the speed is limited, it is practicable to work up to a speed of about 150 tons per day with a hoist of 15 to 20 feet. When it is necessary to obtain greater speed, or to hoist heavier loads rapidly, it is usually better to put in a different hoisting arrangement. The principal objections to the gaff are that it is affected by the wind, and that it is very difficult to adjust, so that it will swing in at the right time where the hoist is high. Within suitable limits, the mast and gaff can be set, so that the tendency of the tub is to swing outward when empty, and inward when full. In this why, the bucket will swing outward and inward very perfectly. After a mast has been set in a wharf it is very liable to shift slightly from the position in which it was placed, so that if the gaff worked perfectly at the start, it might not work as satisfactorily when the mast slightly leaned. For this reason we have made our mast and gaff fittings to fit up against the mast, but not mortised or cut into it, and held to it by iron straps. These can be slackened at any time, and the joint turned in either direction or moved vertically, and again tightened up until it becomes perfectly rigid. In this way it is easy to adjust the gaff whenever it is necessary to do so. The angle at which the gaff sets is governed largely by the local circumstances, usually standing at about an angle of forty-five degrees. It is frequently necessary to use the same gaff at different angles on different vessels, consequently the joints where the motion occurs should be made so that no matter at what angle the gaff may stand the bearing shall be a square one. Otherwise there will be difficulty in lubricating it, and consequently rapid wear. In order to obtain this advantage, we have constructed the joint so that it has one large pin running vertically upon which all the motion of rotation around the mast occurs. At right angles to that we have another, upon which all the vertical motion of the gaff takes place, so that no matter what position the gaff may assume, it has a square bearing in the joint that can be easily lubricated, and will not be subject to undue wear. The joints permit the gaff to be lowered to the ground, to adjust the blocks, or raised to any angle. They swing a little over half a circle, but not entirely around the mast.

They are fitted with plates and bolts to fasten to the lower end of the gaff. This is a more satisfactory method than putting the end of the gaff into a socket, where it is liable to decay. The straps of the light mast head fittings are made to fit a mast 12 to 13 inches in diameter, and the gaff fittings to suit a mast 16 or 17 inches in diameter. If the mast is of a different size a blacksmith can easily alter the length of the straps to suit. A drawing is sent

showing the method of putting on, and giving the length to suit a different sized mast. The heavy fittings are made to order to suit any ordinary sized mast. We also supply blocks to support the peak of the gaff for light or ordinary coal hoisting. They are double blocks, lignum vitæ sheave, plain bushing, and take 1⅛ inch Manilla rope. The bands that go round the gaff to fasten the hook and peak blocks are made of steel and very heavy, far beyond the size needed for strength. They are made in three sizes to suit gaffs 4½, 5½, and 6 inches diameter.

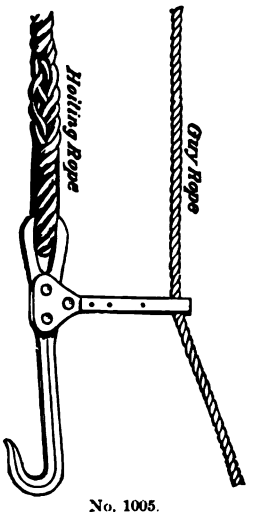




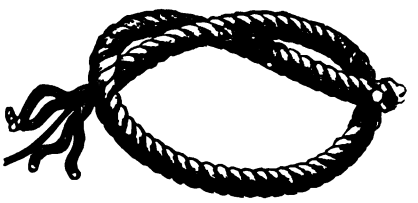


No. 1080.

In hoisting coal with a mast and gaff, it is usually necessary to have a guy line to keep the tub from swinging too much. To overhand this guy line is hard upon the workman's hands. To obviate this difficulty we make two sizes of tub hooks for this purpose, one for ¼ ton and smaller sizes, and the second for tubs up to one-half ton capacity. The guy lines run through a loop on an extension on the hook. It guides the tub as well as if it was attached to the hook, but does not injure the workman's hands, as the rope does not have to be overhanded. The hook is made so that there is plenty of room for a workman to take hold of the hook and not strike his hand in hooking on to the tub. They are usually spliced into the end of the hoisting rope.



No. 1005.
Tub Hook.



No. 1196.
For Hoisting Rope see Catalogue "Ropes."

PRICE LIST.

In ordering, use the names given on cut No. 1080, to prevent any misunderstanding, of the order.

Fittings for Coal Hoisting.

Fittings for handling one ton tubs, mast-head joint with straps to fit a mast 12 or 13 inches diameter at the top, and clevis for attaching the "peak blocks."	$19.00
Universal joint for foot of the gaff, with straps to fit a mast 16 to 17 inches in diameter, and plates and bolts for fastening the foot of the gaff.	19.00
One pair (two blocks) peak blocks, but not including rope,	8.50

Heavy Fittings to Handle Five Ton Loads.

Mast-head joint as above, but heavy,	$45.00
Gaff joint, " "	45.00
Peak blocks, " "	14.00

Gaff Bands.

Gaff Band, 4½ inches diameter,	$ 5.00
" 5½ " "	7.25
" 6½ " "	10.50

Straps for a different size mast will be charged extra. If no directions are given our standard size will be sent, and for the gaff bands, where one is ordered, the 5½ in. will be sent. If two are ordered, 4½ and 5½.

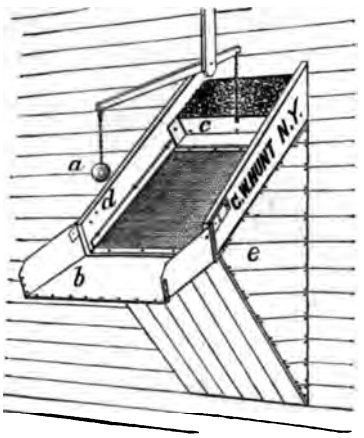
Tub Hooks.

Small size for ⅛ to ¼ ton tub,	$3.50
Large " ⅓ to ½ "	4.50

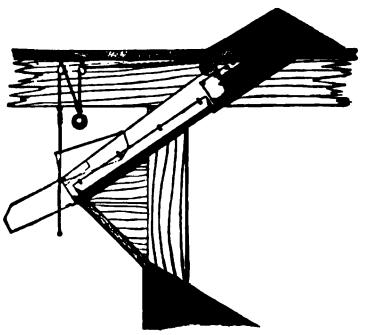
Discount.....

COAL SCREENS.

ANTHRACITE COAL requires to be screened before it is delivered to consumers. This is most conveniently done when it is being loaded into carts. Standing by the side of an ordinary coal screen when anthracite is being run into wagons, and confining the attention to one feature of the process by looking directly across the descending coal, the air seems to be filled for several inches above with flying particles of coal. These particles do not come through with the coal, or they would have dropped through the screen, they are almost entirely caused by the violent motion of the large pieces jostling together and striking on the screen wires which break off little particles from the prominent corners which fly into the air. The longer the screen the more will be the breakage of coal from this cause. Every inch of the screen, after the dust in it has been screened out, is a decided injury from the increased breakage and loss of merchantable coal.



No. 1006.
Coal Screen Chute,
to draw from side of pocket.

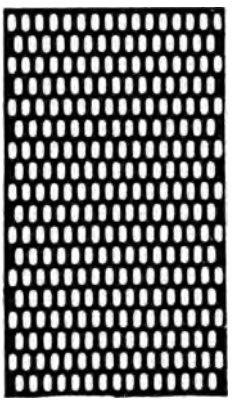


No. 1184.
Coal Screen Chute,
to draw from bottom of pocket.

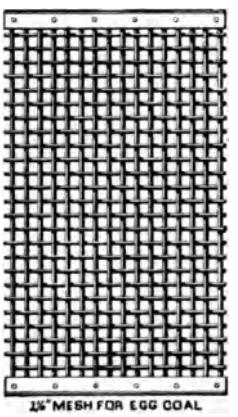
The use of screens in coal pockets is especially advantageous, as they can be placed in the chutes in the bottom of the pocket, and the coal screened as it is run into the carts. If the valve is partially open the coal runs over the screen in a thin sheet, and is screened much better than in any other way, because coal falls upon the upper end of the screen the entire width of the chute, whether the valve is wide open or partially open, so that every inch of the screen is effective. The valve is the invention of Mr. J. N. Briggs, of Albany, N. Y. The important features are: the great ease with which it works, and the facility with which it allows large pieces of coal to pass through. It cannot be clogged or get jammed in closing, as all sliding gates are liable to do. On the bottom of the chute there is hinged a piece of sheet iron, marked "C" in the engraving, which is 5 or 6 inches wide. When standing upright it blocks the coal so that it does not run out. When it is lowered the coal runs over it on to the screen. By lowering it part way, the coal runs over the top as slowly as the workman desires for perfectly screening the coal. In case a large piece of coal or block of wood should be in the coal, it can be readily taken out over the top of the valve "C." This chute is usually boxed in underneath, as shown by the letter "E," so that the screenings run into a receptacle in the rear. The iron extension "B" is put on these chutes to lengthen them

vhen loading. They fold on top of the chute when not in use, giving more room for the teams. These chutes are all made to standard sizes, so that by leaving an opening of the right size in the building they can be inserted and fastened up without expense in fitting. When the chute is to be placed between beams or studs they should be placed 27¼ inches apart, as the chute frames, as sent from the works, are 27 inches wide over all; this leaves ¼ of an inch for variation in the beams. The chute, with screen and valve, is complete in itself when sent from the works.

The screens are of standard size, 24 inches wide by 42 inches long, made to an exact size, so that one can be removed from the chute and another inserted in its place in a few minutes. In this way a bin can be changed to handle any kind of coal desired, the proper mesh screen being put in for the size of coal to be handled. We furnish two entirely distinct kinds of screens for this purpose, one the ordinary wire netting, and the other a perforated plate of iron. Each of these screens is made in three sizes usually used by coal dealers: ½ inch for nut coal, ¾ inch for stove coal and 1¼ inch for egg or broken coal. These measurements are between the wires on the wire screens and the width of the holes in the plate screens. The motion of the coal over the plate screen is smoother than with the old style of wire netting, and the breakage in screening is materially reduced. The screen is also stronger and more durable.



1¼" MESH FOR EGG COAL.
No. 148
Plate Metal Screen.



No. 151.
Woven Wire Screen.

It is sometimes thought that screens should be long, but a long experience and careful observation show that with coal screens 42 inches long, coal is perfectly screened, and that any length beyond that would only increase the breakage and waste of coal.

We keep both styles of these screens in stock, and can make immediate shipments. We furnish them all complete with the frame work, the screens, valve and the connections for opening the valve, so that the purchaser has but to fasten them up. We also furnish the screens separately.

Coal Chute, ready to fasten to the coal pocket timbers, 27 inches wide, outside measurement, to take a screen 24 inches wide and 42 inches long (without screen), $8 75

Screens, 24 inches wide, 42 inches long, either plate or woven wire, to fit the above:

½	inch for	Buckwheat Coal,	4 75
¾	" "	Pea "	4 75
½	" "	Nut "	4 75
¾	" "	Stove "	4 75
1¼	" "	Egg and Broken Coal,	4 75

"ALLEN" SPRING BARROW.

ALL SIZES KEPT IN STOCK.

IN the "ALLEN" BARROW we have endeavored to have the workmanship and materials of unexceptionable quality. It is not intended to compete with the many forms in the market, but is made for those who wish the very best quality and workmanship. It is especially formed for dumping easily. When dumping from a plank run the workman holds one handle at the ordinary height and raises the other slightly, when the barrow rolls over on the end of the handle, emptying most of the load, then a very slight raising of the handles throws out the slight remainder.

The springs under the bearings of the wheel make this barrow much easier to handle, as it runs over irregularities of the runways without violent shocks to either the workman or the load. The wheel is of a new and improved form, 17 inches in diameter, with wrought iron tire, spokes and axle. The axle has lathe turned bearings that run in the springs attached to the wooden handles. These springs are of the best quality of spring steel, and heavy enough to stand the roughest usage. In wheeling over rough places their effect is magical. The tray is made of steel, bottom No 12 gauge, sides No. 14, with band to strengthen the edge. A support is placed across the center of the bottom that adds greatly to the durability of the tray. The form of the tray was obtained by putting the coal in a tray too large, wheeling it over a rough pavement, then making the tray to correspond with the actual position assumed by the coal. When this barrow is filled it does not spill over the front in wheeling. The handles of this barrow are made of wood in preference to iron, because the same strength can be obtained with less weight, it is more convenient for the workmen, and can be more easily repaired in case of accident.

We give below a table of the regular sizes of these wheelbarrows which we keep in stock, together with the capacity in cubic feet, the weight of the barrow, the weight on the hands, both when empty and when loaded with coal. The weight of the barrow is increased slightly on account of the heavier bottom, the crossbar under the center of the tray, and the angle iron crosspiece between the legs, but these add greatly to the durability and convenience of the barrow.

The engravings show the actual position assumed by the workman in handling these barrows, and a comparison of these with the positions assumed in dumping the ordinary barrows will at once show the great advantages they have over the ordinary wheelbarrows in the market. It is evident that only a very slight muscular exertion is needed for the dumping. This comes from making them of exactly the right shape, and not modifying

them to make the sheet steel and other materials cut to "better advantage," or to slightly lessen the cost or make them "just as good."

Six regular sizes are made. The number of the barrow is the number of pounds of coal it carries.

These engravings are made from instantaneous photographs, and show the exact position of the workman in wheeling and in dumping.

Exact position of the workman in wheeling and dumping anthracite coal, from a plank 12 inches wide. Materials that do not run, require the handles raised to the position shown in the engravings below.

Exact position assumed by the workman, in dumping on a level floor.

PRICE LIST "ALLEN" SPRING WHEELBARROW.

No. of Barrow	Pounds of Coal.	Cubic feet.	Weight of Barrow.	Extreme width of the tray.	Weight on handles empty.	Weight on handle when loaded with Coal.	Price.
185	185	3½	124 lbs.	36 inches.	26 lbs.	78	$15 50
225	225	4½	126 "	37 "	26½ "	85	16 25
275	275	5½	134 "	39 "	26½ "	92	17 00
325	325	6	136 "	41 "	27 "	98	18 00
375	375	7	139 "	43 "	27½ "	105	19 00
450	450	8½	148 "	44 "	27 "	110	20 00

The 225 size is the one generally used in loading vessels from coal shipping wharves, ten loads making one gross ton.

The large size barrows are more suitable for handling lighter materials, such as tan bark, sawdust, etc. Every part is made to a templet so that they are exact duplicates in every respect.

Discount.....

 No. 1465.

MANILA FIBRE.

The long hank is 10 feet 7 inches long. There is the same difference in the streng of the "butts" and the "tips" of manila fibre, as there is in the butts and tops of hick wagon timber. "STEVEDORE" rope is not only made from selected stock, but from the bu *only*. Each hank used in making this rope has the tips cut off, as shown.

"STEVEDORE"

MANILA ROPE.

The C. W. HUNT COMPANY, make a Special Rope from selected Manila, laid up with a plumbago lubricant having the twist of the threads and the strands carefully adjusted to the work to be done. The plumbago reduces the internal friction in bending over the pulleys, and makes the rope partially waterproof. It is the only transmission rope that will stand exposure to the weather.

We make this rope both for transmission and for hoisting, 4 *strand*, in coils of about 1130 feet long, or cut to any length desired. 4 strand transmission ropes longer than 1130 feet must be spliced. We lay it up 3 *strand*, to any length up to 5000 feet in one piece.

HOISTING ROPE.

The following sizes of 4 strand are kept in stock in coils of about 1130 feet, or cut to specified lengths.

2¾	inch circumference.
3	" "
3¼	" "
3½	" "
4	" "
4½	" "
5	" "
5½	" "

Other sizes made to order at the same price, but shipments will be about one week after receipt of order.

Order by the Circumference.

TRANSMISSION ROPE.

The following are the usual sizes of transmission rope which we supply in lengths up to 1130 feet of 4 strand and to 5000 feet of 3 strand in a single piece. Lengths of over 1130 feet of 4 strand must be spliced which we will do without charge.

DIAMETERS.

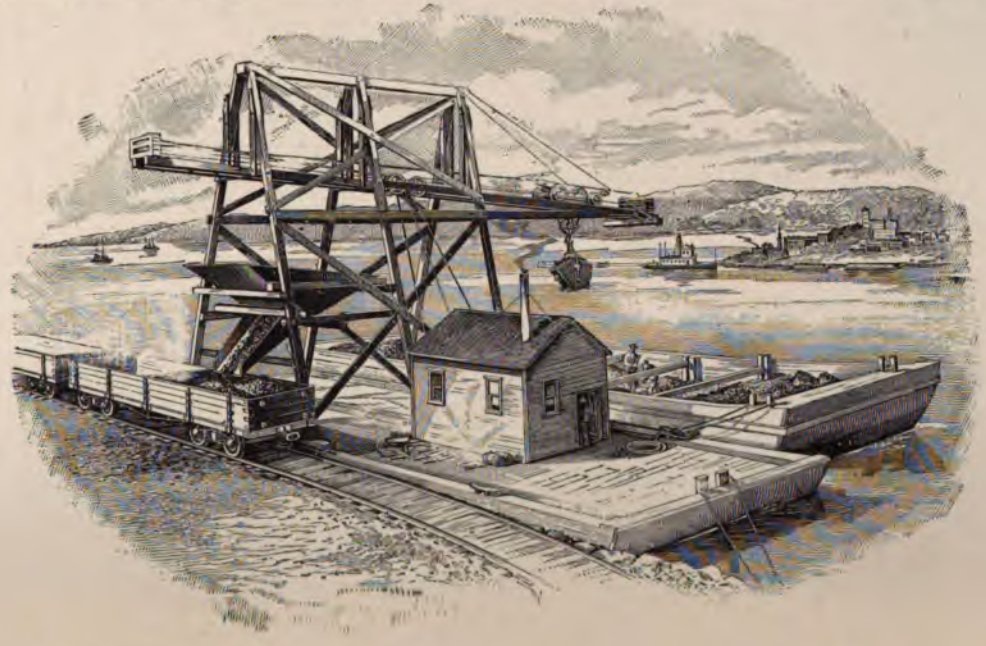
⅝	inch,	-	1⅜ inch.
¾	"	-	1½ "
⅞	"	-	1⅝ "
1	"	-	1¾ "
1⅛	"	-	1⅞ "
1¼	"	-	2 "

Order Transmission Rope by the Diameter.

This rope is almost universally used in all parts of this country for hoisting and for transmission of power. Nearly all the regular line ocean steamships use it for hoisting cargo in New York, and carry it home to do the hoisting there. We also have customers in many foreign countries. Notwithstanding the high prices and expenses of shipping abroad it is still cheaper than any other rope. It costs more per pound than other rope, but we guarantee it to do more work in proportion to the price than any other rope, without any exceptions whatever.

FOR DESCRIPTION, SIZES AND PRICES SEE CATALOGUE "ROPE."

Hunt Transfer Machinery, arranged for Handling Phosphates at the Wharf of the Liebig Manufacturing Co., Carteret, New Jersey.



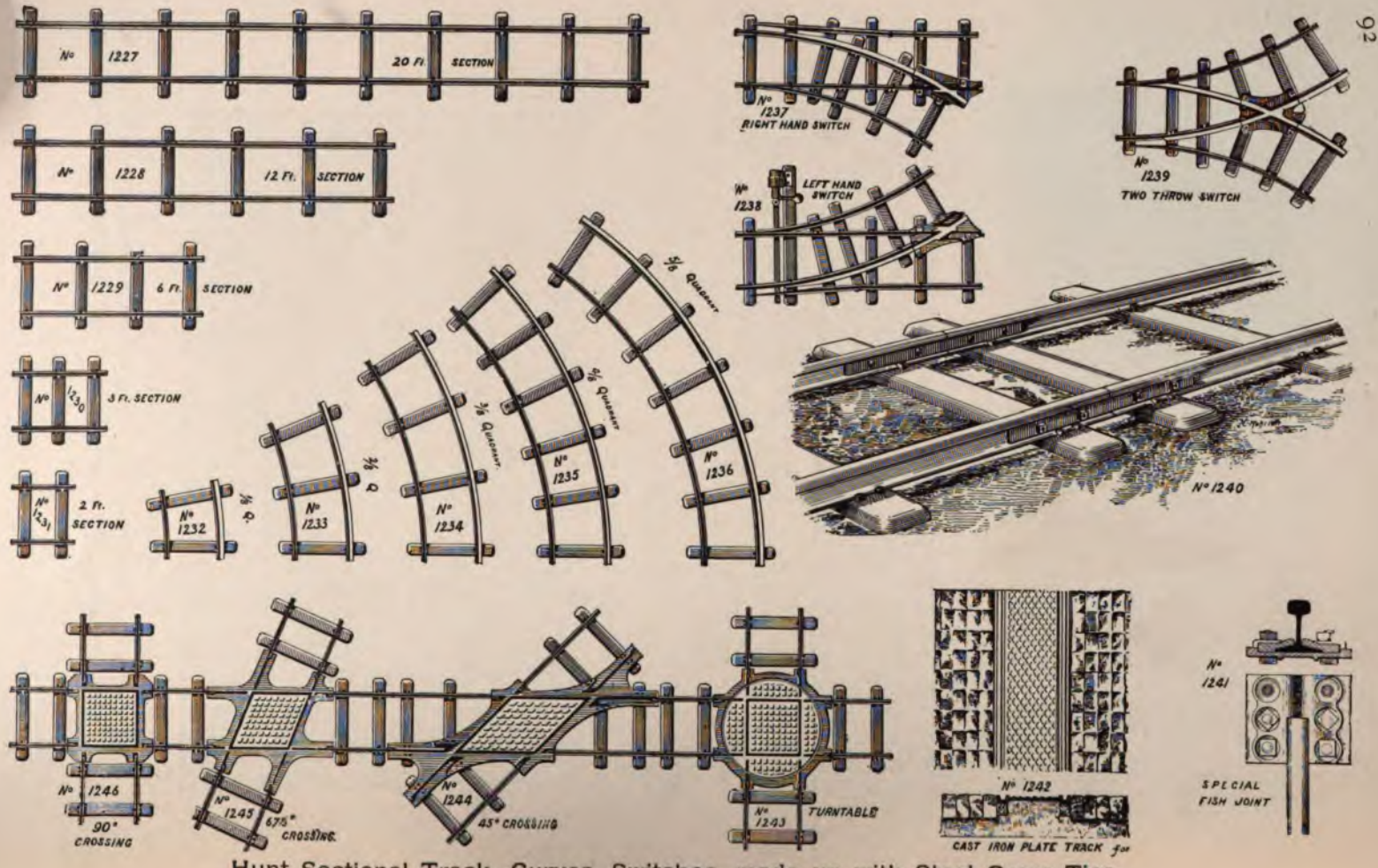
Hunt Transfer Machinery, handling Coal at the Wharf of the W. L. Pierce & Co., Evansville, Indiana.

No. 1275.
Tip Cars, capacity 12 to 36 cubic feet.

No. 1162.
Charging Cars for boiler rooms and retort houses.

No. 102.
Self Dumping Cars for elevated tracks.

DESCRIPTION OF TIP, CHARGING, PUSH, FLAT, EIGHT-WHEEL FOUNDRY, CORE OVEN, COKE, , TROLLEY CARS, STEAM AND ELECTRIC LOCOMOTIVES, SEND FOR CATALOGUE ON INDUSTRIAL VAYS.



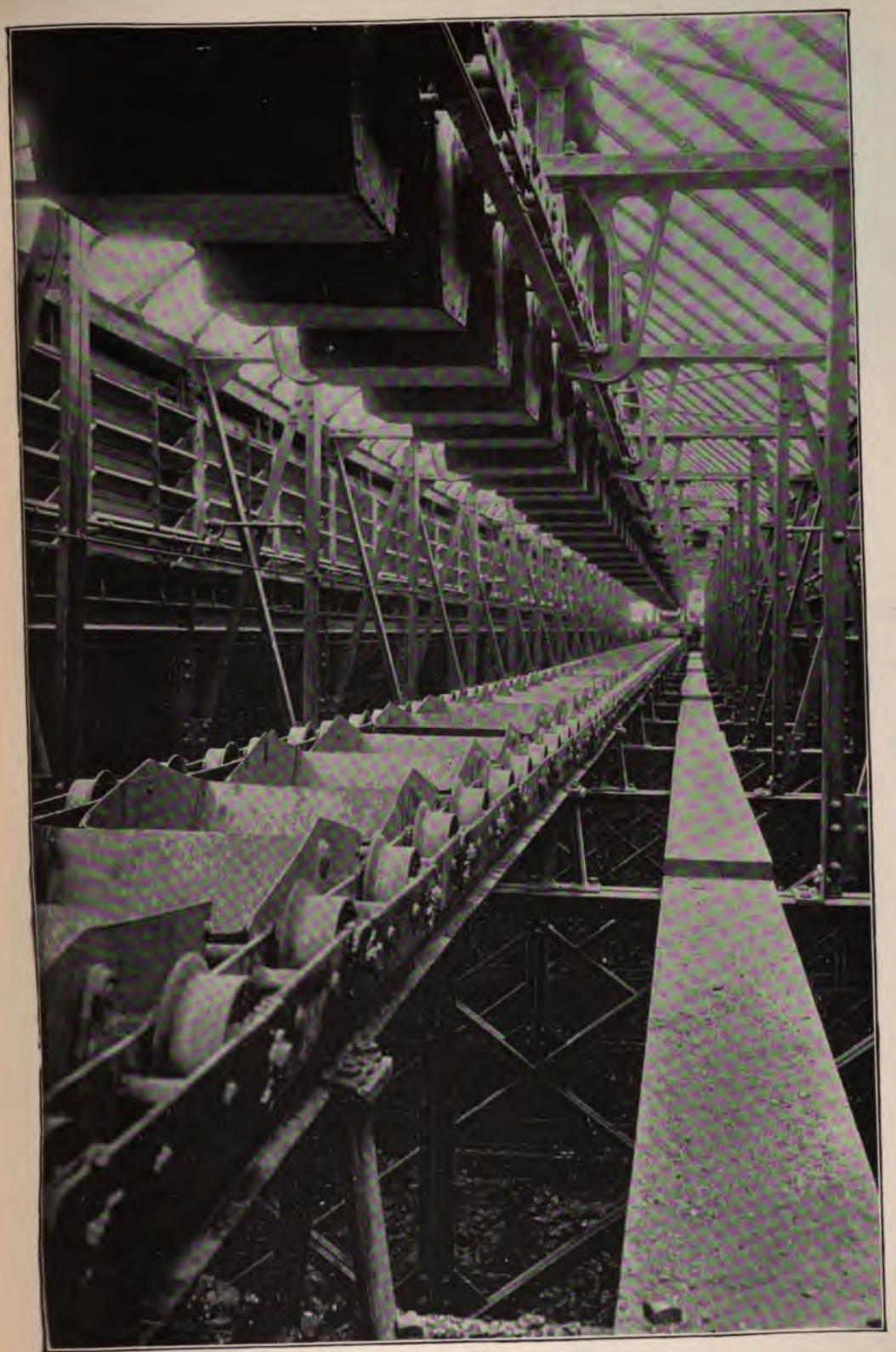
Hunt Sectional Track, Curves, Switches, made up with Steel Cross-Ties.

For Description see Catalogue "Industrial Railways."

No. 94,032.

WM. DREISKE'S COAL YARD, CHICAGO, ILL.

The coal is unloaded from vessels and stored in the yard by Hunt Elevators and Automatic Cars and taken from the yard by a Noiseless Conveyor, and put in pockets, ready to load into wagons without hand labor.



No. 1437.

HUNT NOISELESS CONVEYOR.

View in the Monitor of the Coal Building of the Brooklyn Waterworks.

THE HUNT NOISELESS CONVEYOR.

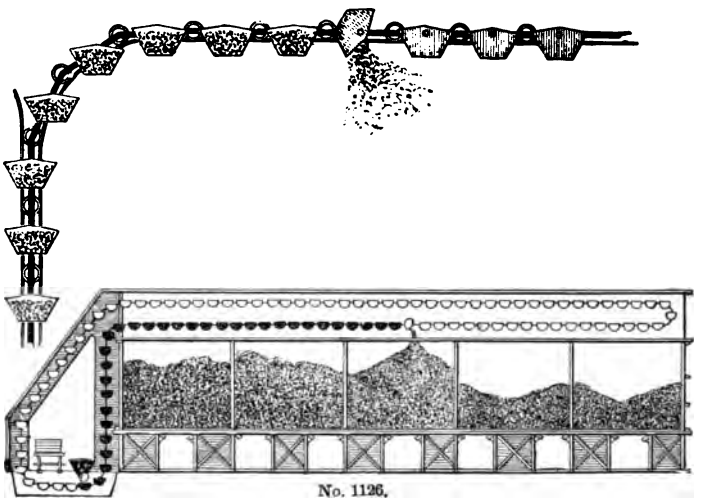
A UNIVERSAL CONVEYOR FOR

Coaling Locomotives, Boiler Rooms,

Gas Companies, Coal Yards,

Shipping Docks, Manufactories.

The use of a belt or chain with buckets attached for moving materials answers the purpose in many circumstances better than any other method. In presenting a new conveyor, we wish to point out its chief peculiarities, which will show a most radical change of details to do essentially the same work as other conveyors; that is, the carrying of materials in manufacturing establishments.

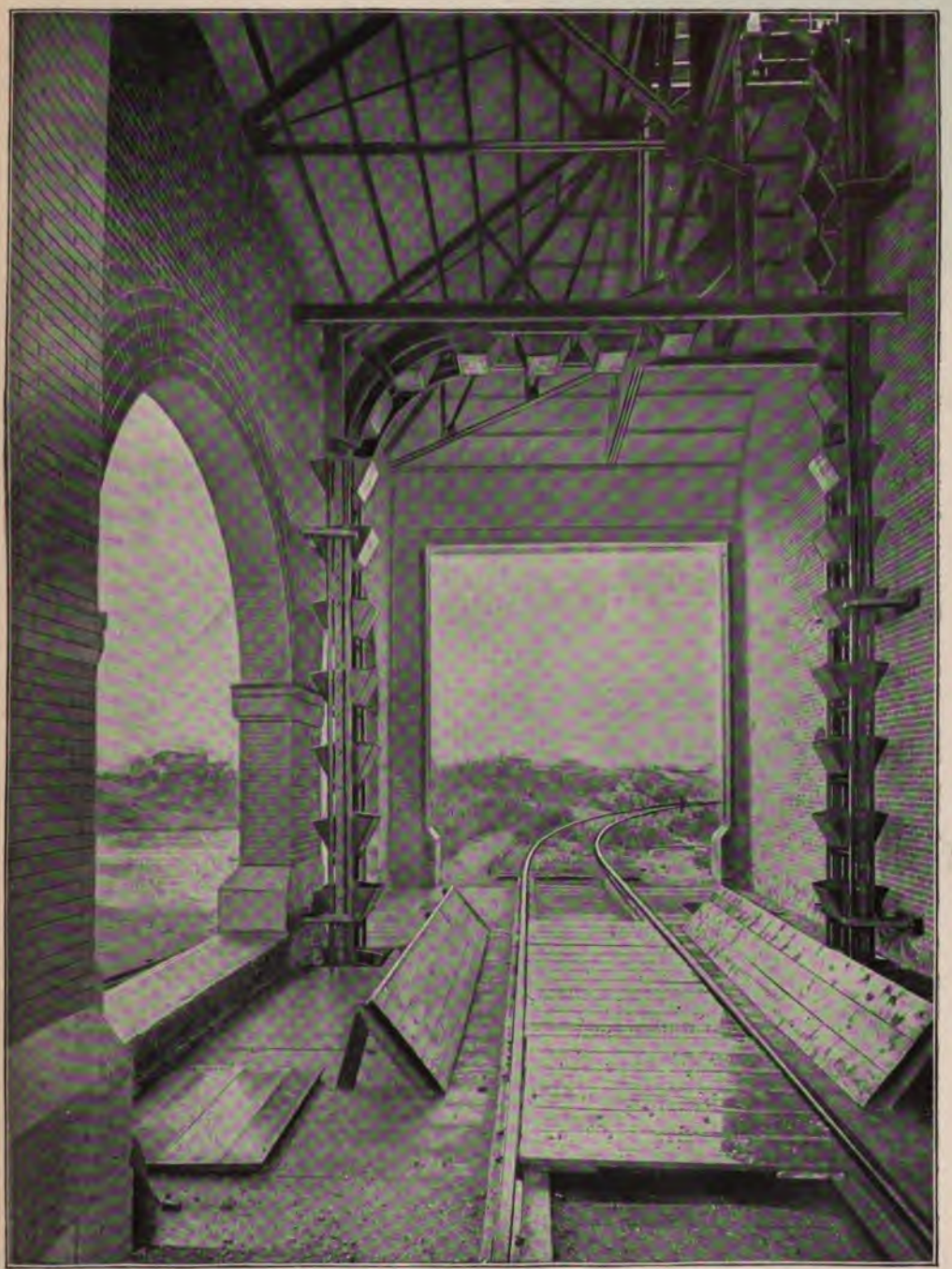


No. 1126.

This conveyor carries the material from the loading point to the storage bins in a direction either vertical, inclined or horizontal, without shock, breakage or violence.

This Conveyor differs from the ordinary chain conveyors used for this purpose in many particulars. While it is usually called a conveyor and classed with this machinery, it is, in fact, a series of cars linked together, having a body hung on pivots, gravity keeping them in an upright position, no matter how tortuous the track over which the cars may be drawn.

It will be seen by Cut No. 1126, that the buckets hang upright in all positions of the chain, consequently the chain can be run in any direction that may be necessary without affecting the buckets, as the load will be carried just as securely in one direction as in another, and would carry a liquid as well as any other material.



No. 1436.

CONVEYOR as arranged in the RIDGWOOD PUMPING STATION, BROOKLYN WATER WORKS.

The coal is dumped from the railway cars directly into a hopper beneath the track, from which the conveyor carries it to the storage building.

The features that are peculiar to this machine in its operation are:

First. The material is carried to its destination, and is not disturbed or shaken on the way.

Second. The whole machine is carried on wheels, and every part thoroughly lubricated.

Third. The buckets can be made large enough to carry the largest lump bituminous coal.

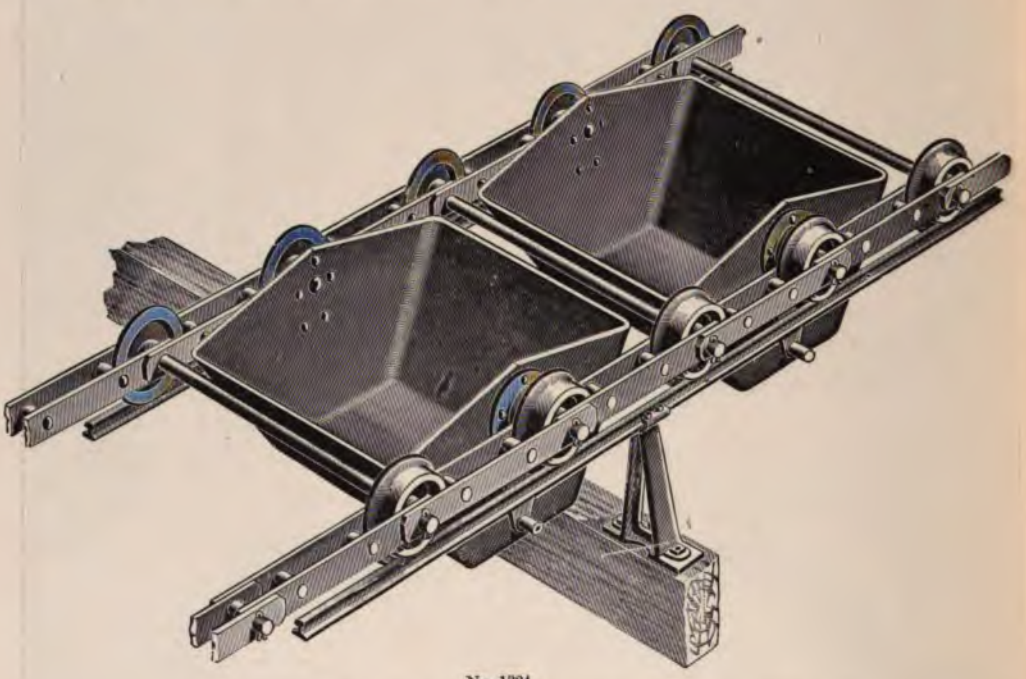
Fourth. The change of direction of the chain is accomplished by running around curves, instead of over sprocket wheels.

Fifth. The chain is driven by pawls, instead of by sprocket wheels.

Sixth. It is moved very slowly, the capacity being obtained by the size of the buckets, and not by the speed of the chain.

Seventh. There is no conveying machine capable of doing the amount of work at so small a cost for maintenance, power and labor.

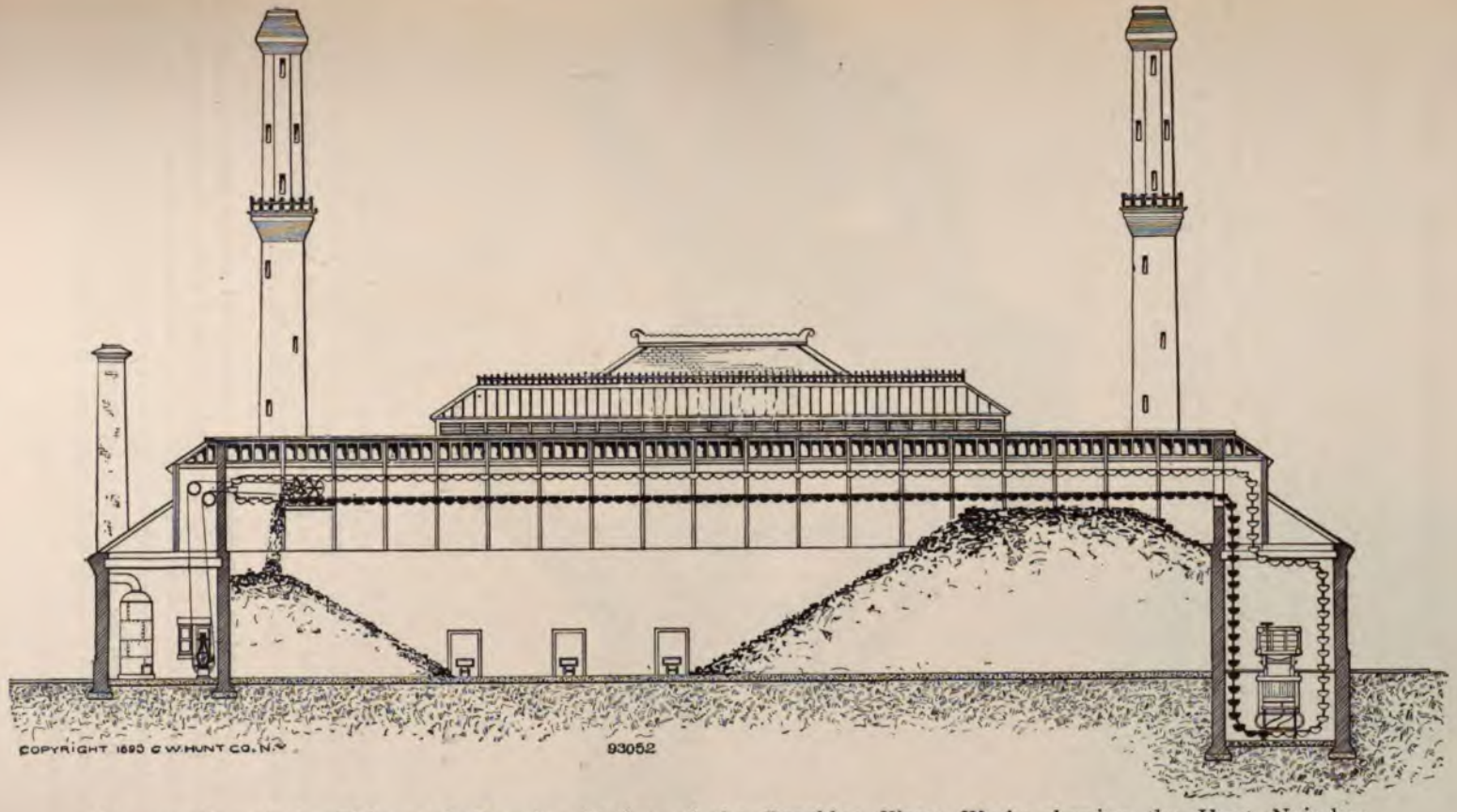
Eighth. The machine is noiseless in its operation.



No. 1324.

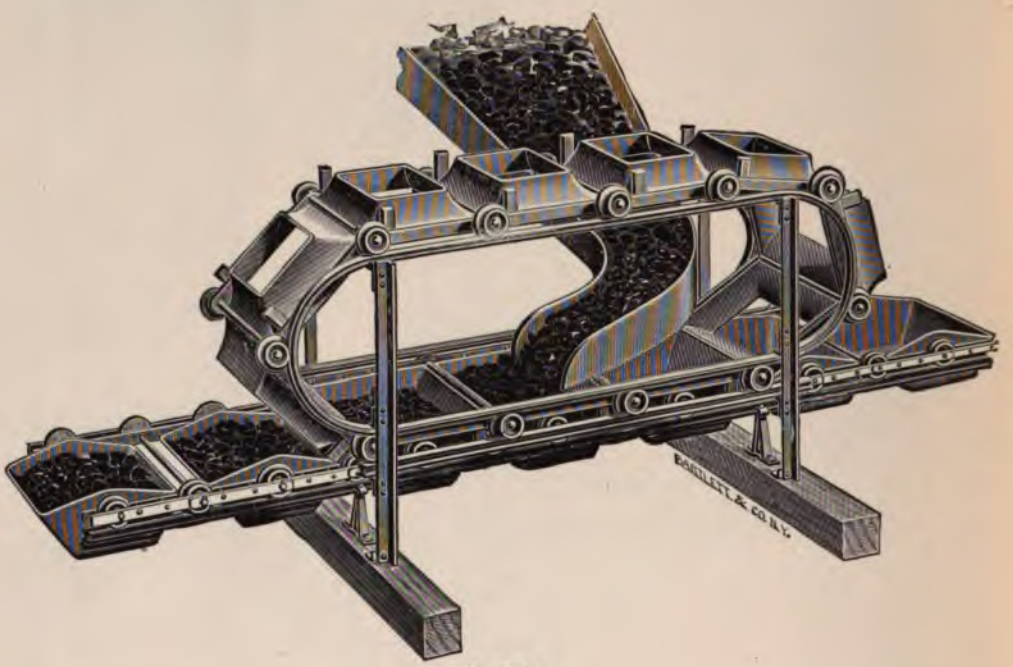
Conveyor Chain and Buckets. The buckets are made any size to suit the work.

The chain is composed of very heavy wrought iron links. On the axle to which the links are attached are wheels having a flange like ordinary railway wheels. The axle can be thoroughly lubricated, so that the bearings are as durable as in other machinery used in manufacturing establishments. The long links make but few joints for lubrication. The wheels of this chain run on a track similar to an ordinary railway, and as the conveyor is an endless chain it is always in equilibrium when not carrying materials, and the force to move it is only the force required to overcome the friction from the weight on the wheels. The coefficient of friction is greater than that in ordinary railways, but still it is comparatively small at the greatest, as all the parts are thoroughly lubricated.



Cross section of the Ridgewood Pumping Station of the Brooklyn Water Works, showing the Hunt Noiseless Conveyor taking coal from the cars to the storage room. See Cuts Nos. 1320, 1436 and 1437.

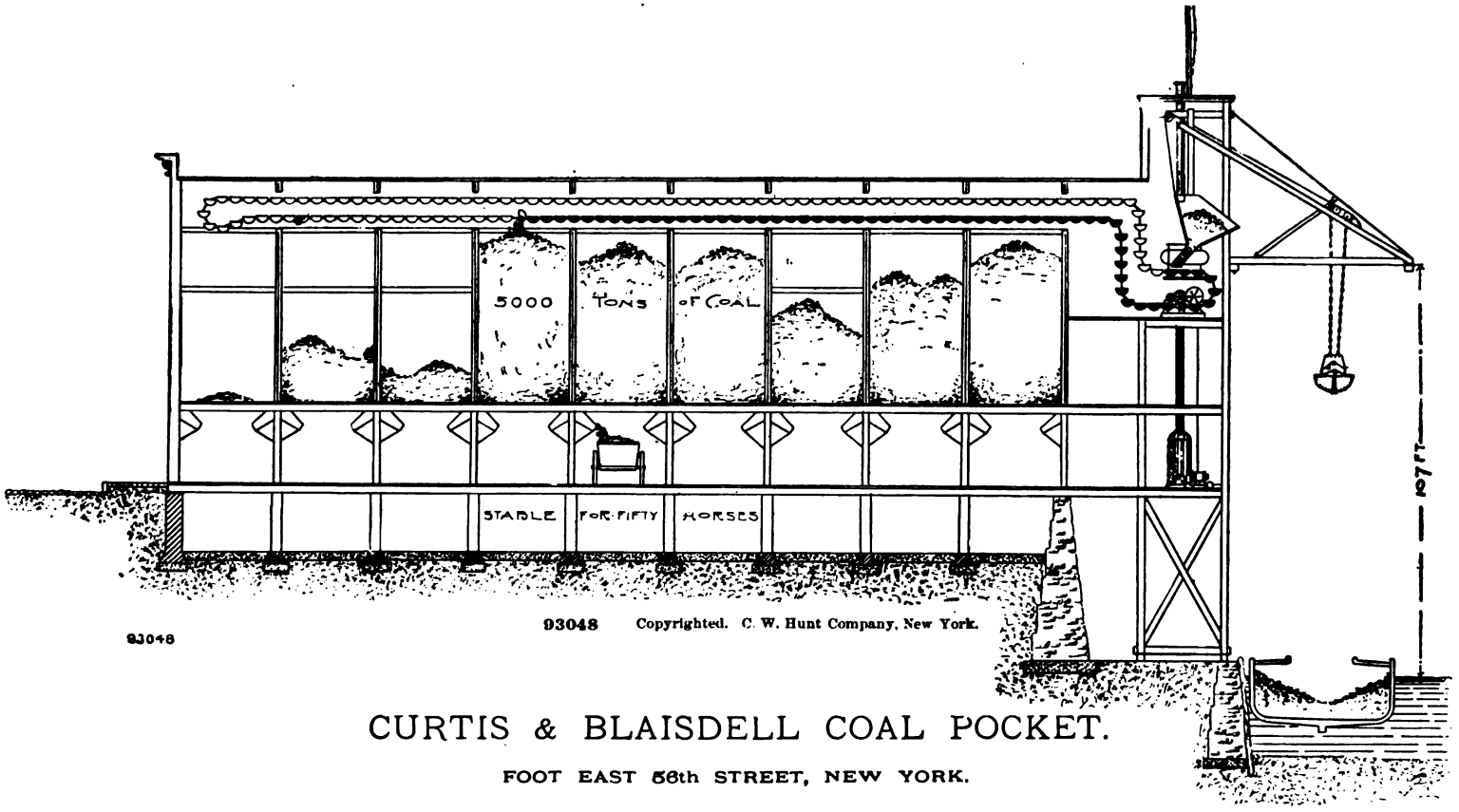
The necessity for a special method of filling the buckets will be apparent when we consider that they swing freely on pivots and might oscillate to a harmful extent or might be loaded on one side and remain at an angle during the trip. This is accomplished so perfectly that an observer watching the machine at work would not notice that there was any liability of swinging or uneven loading. We use two methods of filling the buckets, one a "measuring filler," the other a "spout filler." The "measuring filler" delivers to each passing bucket the proper quantity of material. It operates very rapidly and is suitable for any material up to the size of broken coal.



No. 1334.

The "spout filler," Cut No. 1334, is a continuous feed, the material running into the buckets, each one filling as it passes. This is suitable for all materials, and is especially so for bituminous coal having large lumps. No matter how large the lumps are, a machine can be made large enough to handle them with ease.

Several can be used in succession for measuring and mixing materials, each putting in the buckets a definite quantity of the material. The first one may put in broken stone, the second sand, the third cement, the fourth water. In this case each conveyor bucket contains all the ingredients in the proportions required by the engineer in charge, who adjusts the capacity of each filler and the result is not dependent on the skill and care of the workman. As the buckets dump in succession, the materials will be fairly well mixed when they enter the mixing machine.

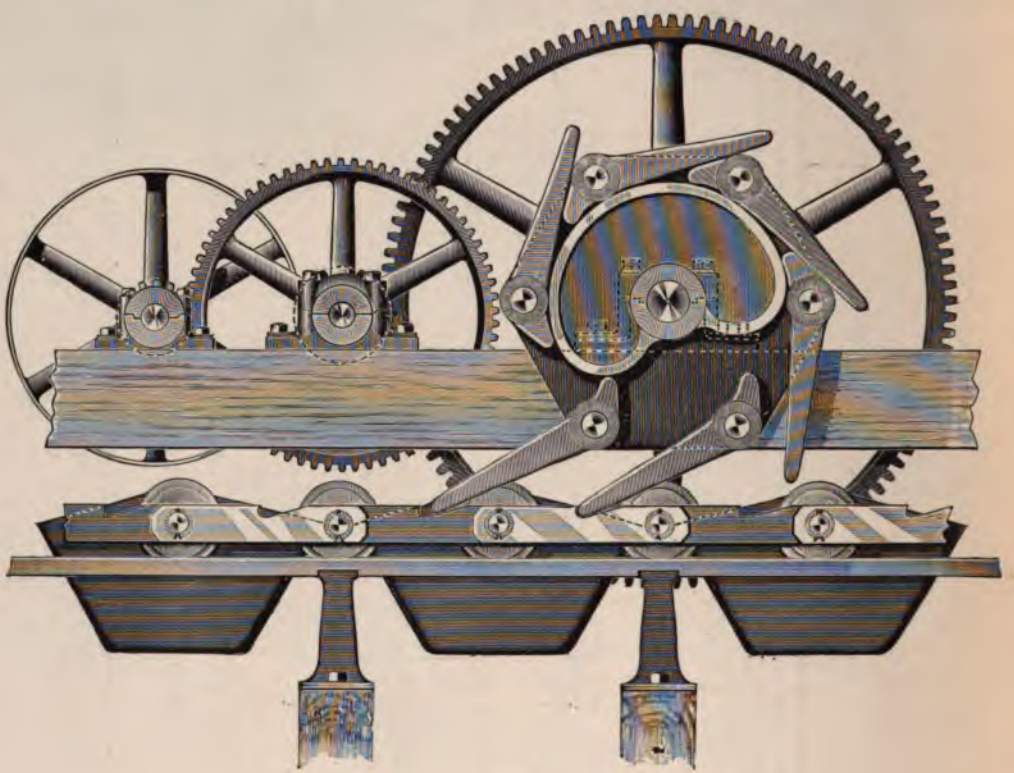


CURTIS & BLAISDELL COAL POCKET.

FOOT EAST 56th STREET, NEW YORK.

The coal is hoisted by an automatic steam shovel, and dumped into a hopper 107 feet above the water. The conveyor distributes the coal as fast as hoisted to the bins, from which it is drawn into the wagons and carts. Three men are employed, who do all the work of transferring the coal from the boat to the bins ready for delivery: one hoists the coal from the vessel to the hopper, and the second attends the conveyor, and the third is on the vessel to lend a hand when needed, and to scrape up the last of the coal. The average work is 600 tons in 10 hours.

Instead of being driven by sprocket wheels, the Hunt Conveyor is driven by pawls pushing the chain along, as shown in Cut No. 1323. In this manner we obviate entirely the wear of the sprocket wheels and of the chain. This method gives a motion that is evener and steadier, and also permits the power to be applied to any part of the chain wherever it is most convenient. The wear on the chain is an insignificant amount, owing to the links being oiled in the joints, consequently the working, years after it is erected, is precisely the same as when first started.

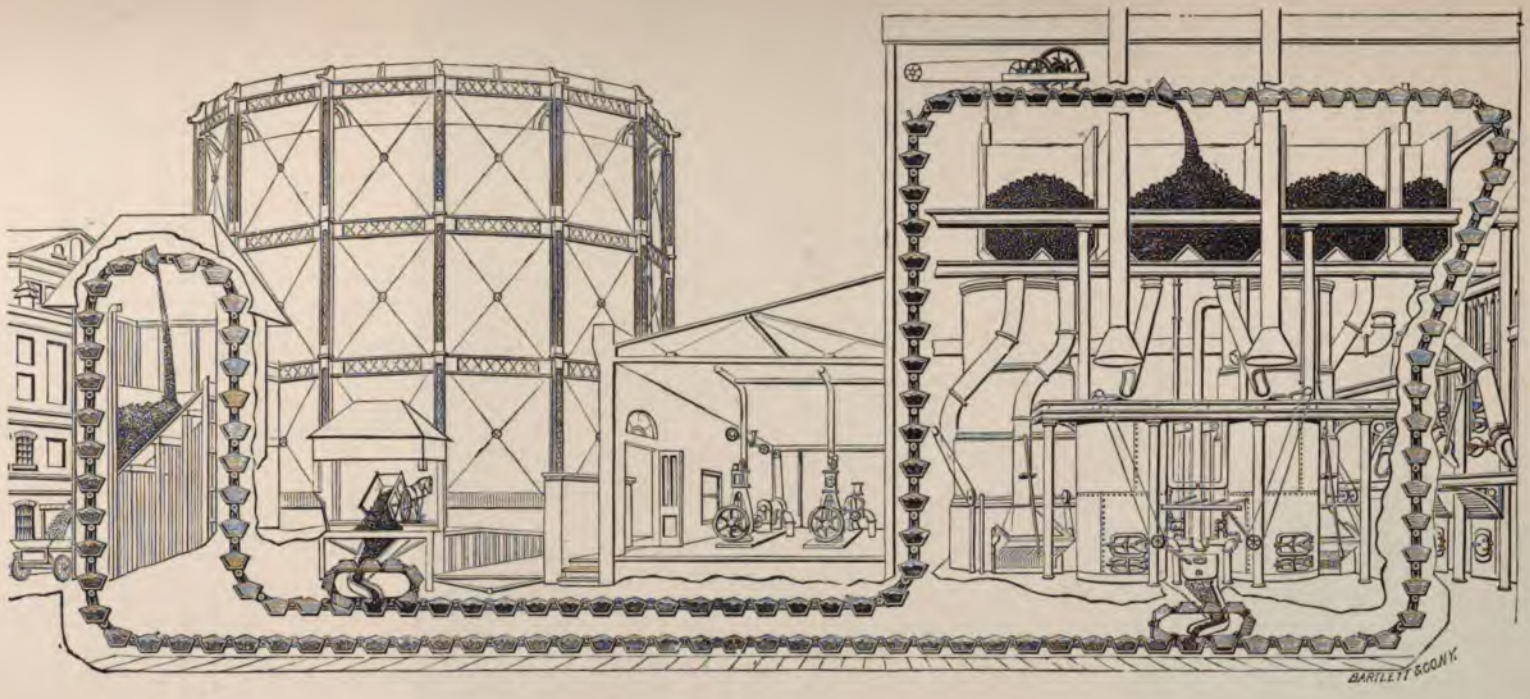


No. 1323.

Driving Mechanism of the Hunt Conveyor.

The chain is run at a very low speed, and the capacity obtained by having lar buckets. This makes a more expensive machine, but adds correspondingly to its dur bility and satisfaction in use. The ordinary size chain with buckets carrying two cul feet of material runs at a speed of fifteen buckets per minute, or about forty tons of c per hour. Should the business temporarily require a greater capacity, the speed can increased up to twenty-five buckets per minute without difficulty, giving a capacity about eighty tons of coal per hour; but if the amount to be handled is above the nor capacity, a machine with larger buckets should be used. If the work to be done smaller, the speed can be reduced to correspond.

In the practical construction of this machine special pains have been taken to ma it strong, with large bearing surfaces, and the workmanship and materials excellent every respect. We try to build this as we build all other machinery; that is, as thorough good, both in material and workmanship, as though the purchaser had personally selecte the stock and superintended the construction.



No. 1359.

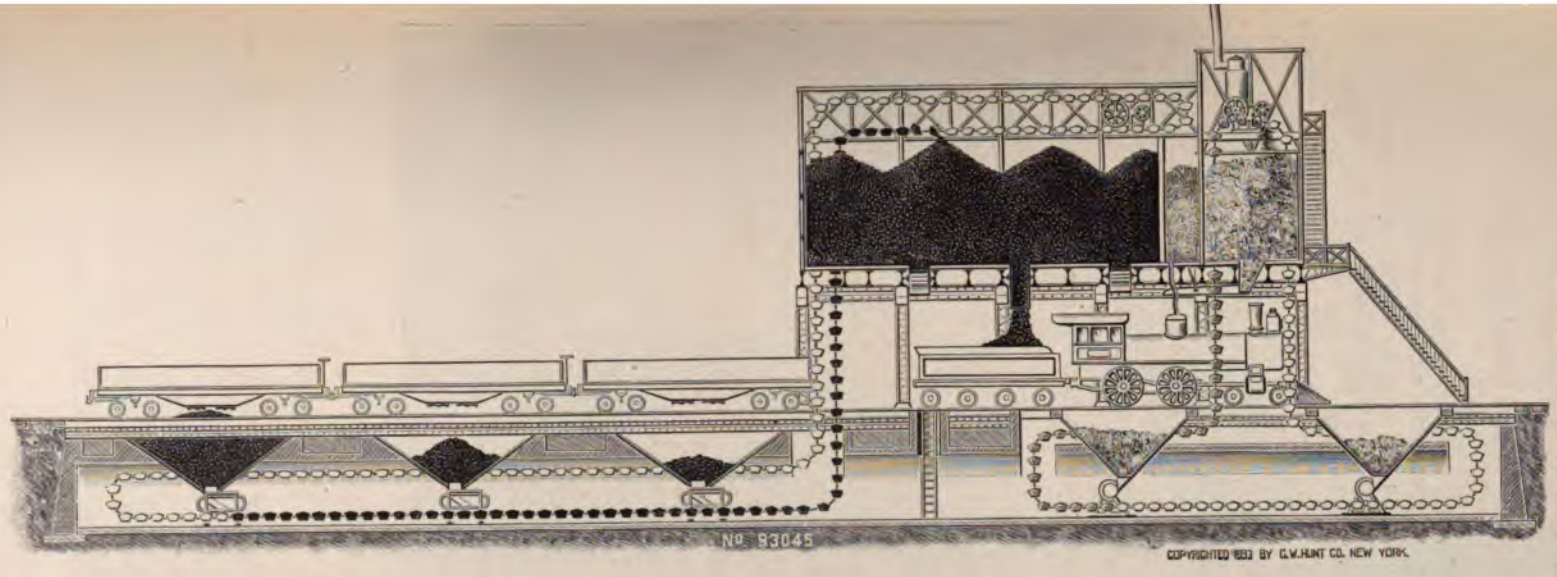
The Milwaukee Gas Light Company.

The coal is brought from the storehouse across the street and dumped into the Conveyor and carried underneath the floors to the generator room and dumped into large hoppers over the generators. The buckets on the return carry the ashes out into the yard and dumps them into a hopper to be drawn into a cart for removal. The Conveyor is curved to suit the space that could be found in a previously constructed building.

Gas Companies also make a remarkably useful application in carrying both the coal to the generator, and the same machine carrying the ashes and refuse out. The whole machine occupies no valuable space, being carried beneath the floor or underneath the roof, and does its work so silently that it is necessary for one in the same room to look to see whether it is in operation. The application shown in Cut No. 1359 illustrates that the conditions and surroundings could be changed to almost any extent, and the Conveyor be just as applicable as it evidently is here.

No. 1325.
Milwaukee Gas Light Company.

The mixing of concrete in large works, when the rapidity of operation would justify a sufficient plant, is a case where the Conveyor would not only give the capacity needed, but have the valuable quality of giving a more perfect mixture and a higher quality of work than could be hoped for by such workmen as the old ways necessarily employ. The mixing of other materials in manufacturing can be done as readily; for instance, the mixing of acid phosphate with the proper proportions of kainit and ammonia can be automatically done, and at the same time delivered to the upper floor for mixing, and delivered by gravity to cars for shipment.



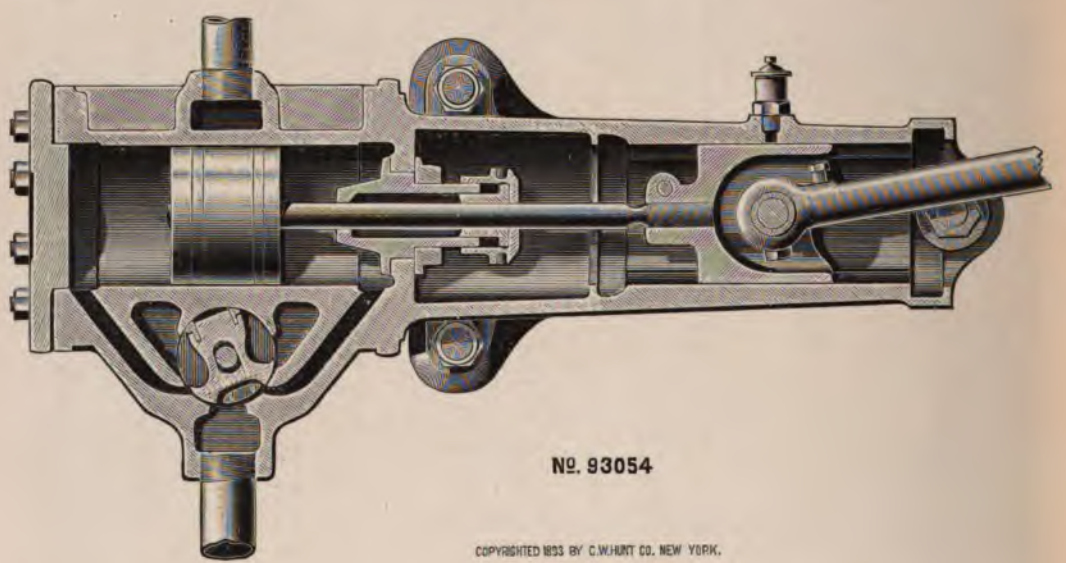
LOCOMOTIVE SUPPLY STATION OF THE PHILADELPHIA & READING RAILROAD CO.,
MARKET STREET STATION, PHILADELPHIA.

Four locomotives can simultaneously take coal, sand and water, and dump ashes.

All material is handled by the Hunt Conveyor. Coal is put in the bin at 60 tons, sand 80 tons, and ashes 40 tons per hour.

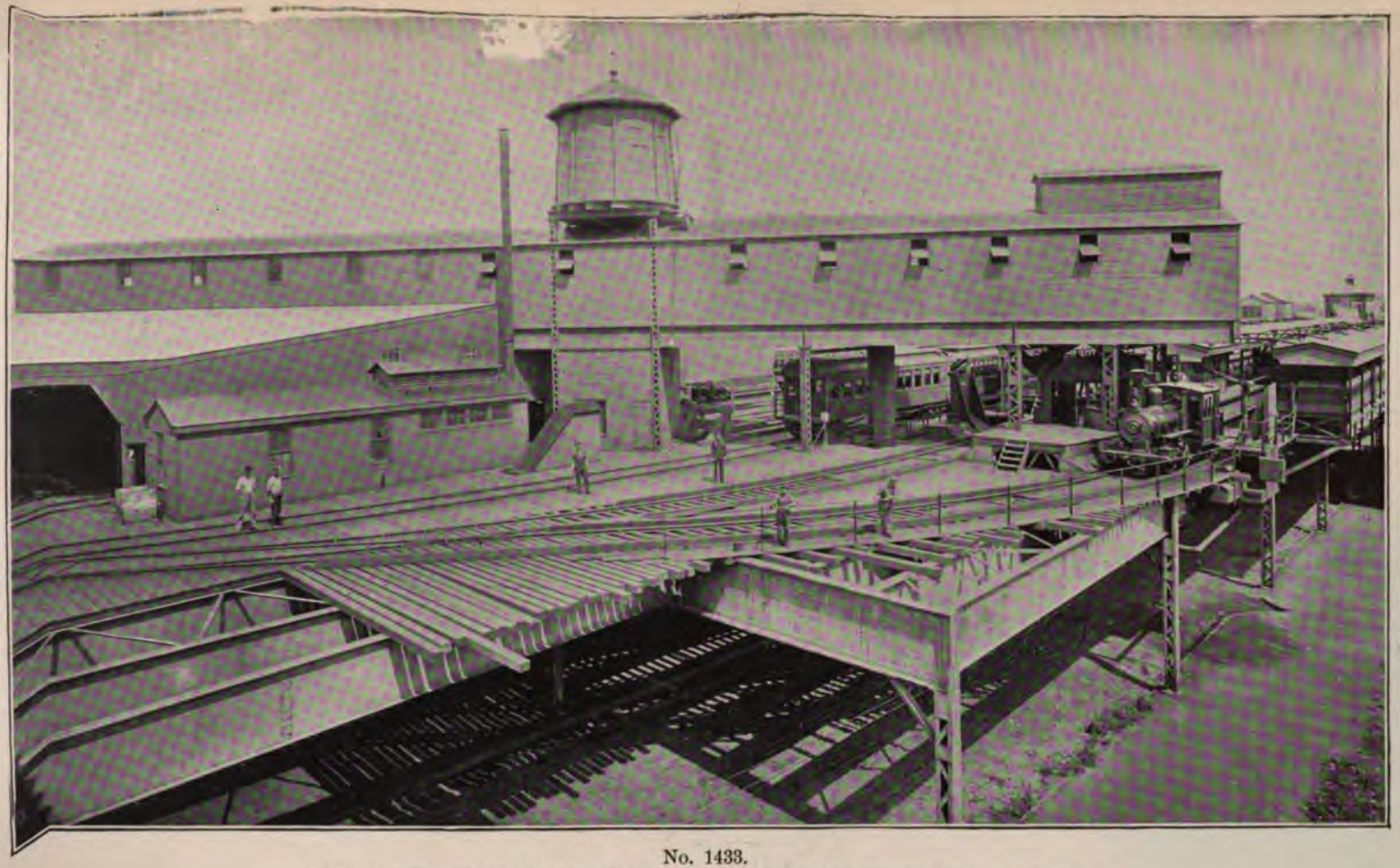
Electric light and railway boiler plants can be arranged to not only take the coal from the cars to the boiler-room, but the same machine can store a reserve supply, and bring it forward again when needed. When the plant is properly arranged, the same Conveyor will take the ashes and dump into a pocket for removal to the dumping ground. In several large power plants this work is done at a surprisingly small labor expense, and, as it is substantially noiseless, it is an ideal machine for the purpose.

The handling of coal on ocean steamships is a work that now requires a greater tax on human energies than any other occupation ; the most laborious work in heated air, confined space, and a pitching and rolling vessel. The Conveyor carries the coal from the bunkers to the boiler-room, and delivers it at any desired height. On merchant steamships it saves the great expense of "Coal Passers ;" on naval vessels it permits the carrying of a much larger crew that will be available in action, a time when every available man is wanted for service, and not to perform the work that steel and forethought ought to do.



Special Non-Freezing Engine designed especially for this Conveyor.—There are no Pockets where Water can lodge and freeze.

The loading of vessels is another most important application of this machine. The coal can be dumped directly into the Conveyor running underneath the track, then carried vertically high enough to clear the freeboard of the vessels, then run over to the hatch, and vertically downward into the hold, and the bucket dumped at the lower turn within two feet of the coal in the hold of the vessel. The coal gets only the breakage of falling from the car hopper to the track, a distance of about three feet, and the dumping of the bucket in the hold of the vessel, about three feet. The coal is put aboard as carefully as though a workman carried it from the car down into the hold of a vessel in a basket. For tender coals going to a market requiring lump coal, the saving in merchantable coal would justify almost any expenditure.



No. 1433.

FIFTH AVENUE COALING STATION OF BROOKLYN ELEVATED RAILROAD.

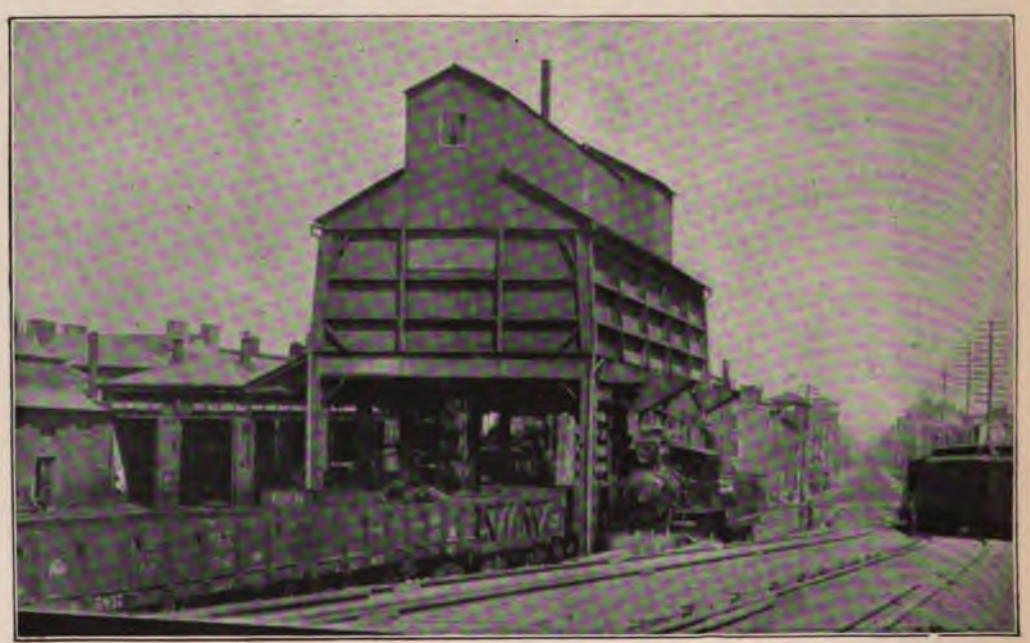
The coal is received in hoppers on the lower level, and carried by conveyor to the long pocket over the locomotives.

This Conveyor is applicable to the handling of almost every kind of material in manufacturing establishments.

In coal yards it is especially suitable, as it will carry the coal horizontally or at any angle, with equal facility. By carrying one part of the chain over the pile, and the other beneath the pile, one Conveyor will both take the coal up and store it in the building, and when the coal is wanted, the lower part of the chain takes it out of the pile and delivers it to a pocket, or makes any other disposition of it desired.

The coaling of locomotives is shown in Cut 1304, and the machine offers a remarkable combination of good points in large coaling stations.

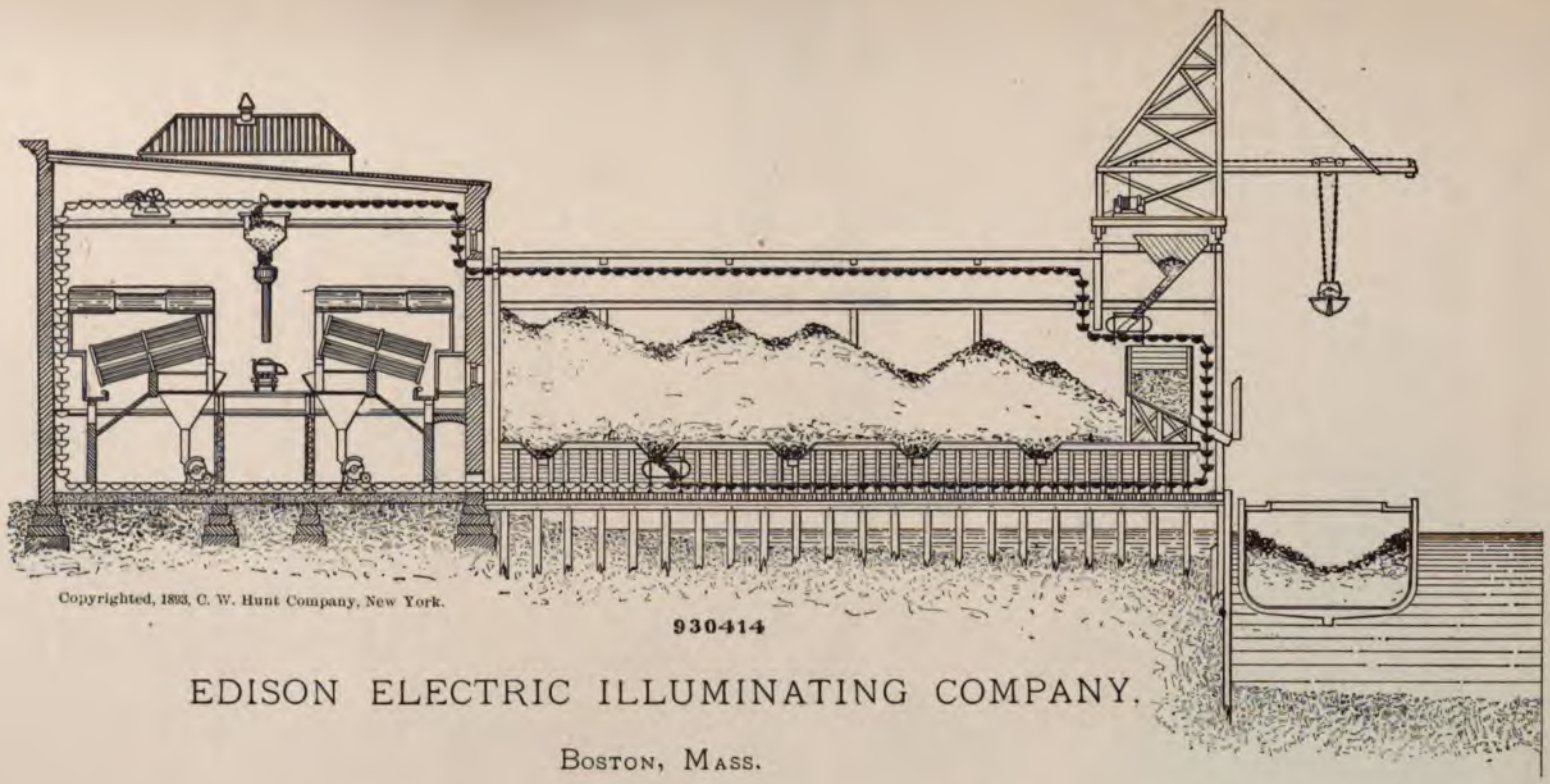
In the Conveyor of the Brooklyn Elevated Railroad, the coal for coaling the locomotives is taken from the pile in the yard, and carried up into the pocket over the elevated railway, a vertical height of sixty-nine feet, and the horse-power actually used in the regular running of this machine under ordinary conditions of service is 10 horse-power. In combination with this Conveyor, it will be observed in Cut No. 93049, are chutes, so arranged that the action of folding them up recharges them with a given quantity of coal, and upon being pulled down the load is spouted into the tender, and again folded up, where it is clear of passing trains and the heads of careless brakemen.



No. 93049.

PHILADELPHIA AND READING RAILROAD LOCOMOTIVE COALING STATION, PHILADELPHIA.

To the practical railroad man it will be readily apparent that there are many advantages in placing a coaling plant across a line of railroad, for, having chutes over each track, an engine loses no time in taking a special siding, but can coal on the track where it happens to be. The coal is here lifted a vertical height of sixty-nine feet, at the rate of 60 tons per hour, the ashes from the locomotive, and also the sand, as shown in Cut No. 93045, and the power required to do this is about 10 horse-power under ordinary conditions of service.

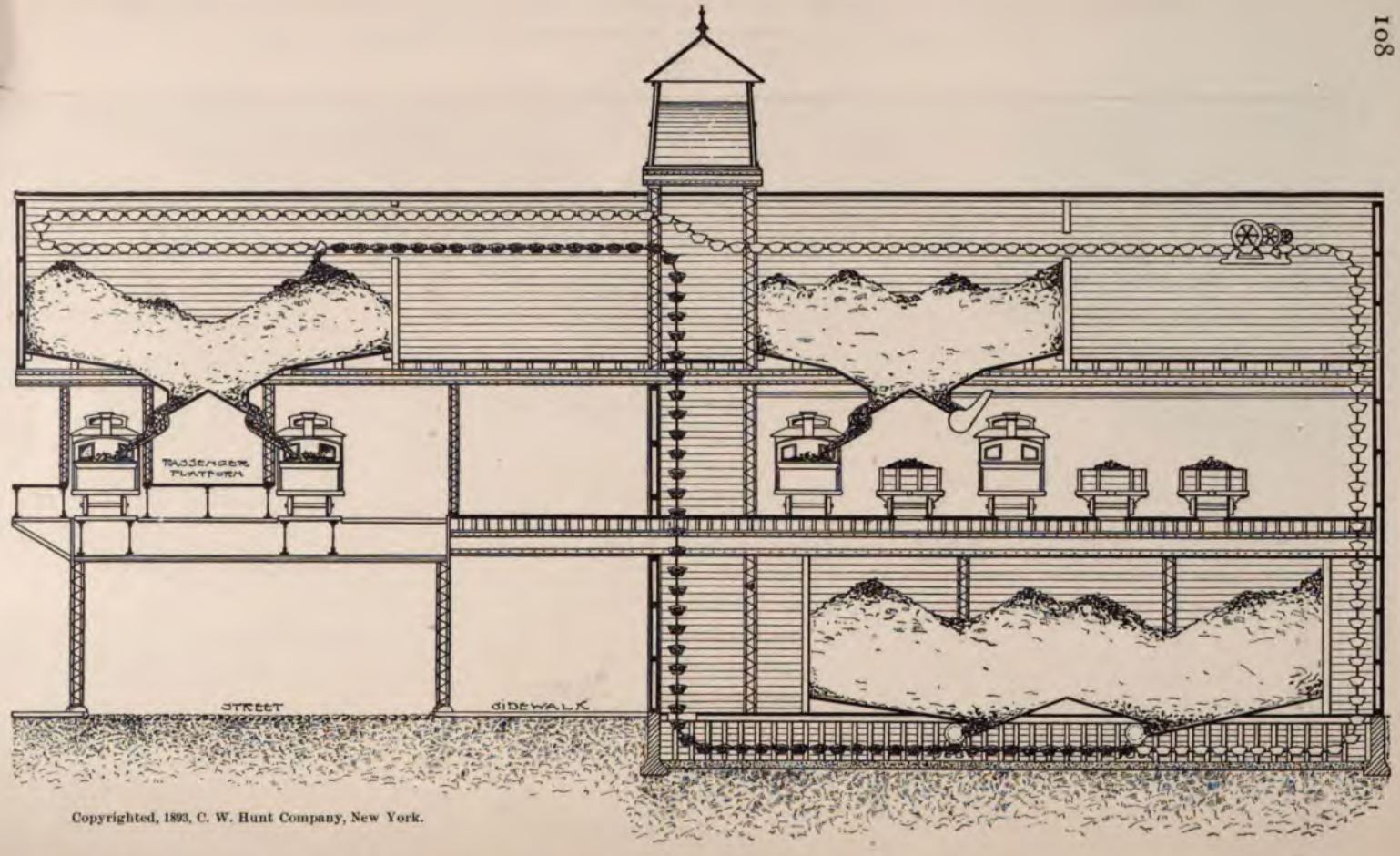


930414

EDISON ELECTRIC ILLUMINATING COMPANY.

BOSTON, MASS.

HUNT'S NOISELESS CONVEYOR, arranged to handle coal and ashes. The Conveyor supplies the boilers either from the storage bins or from the boats direct. The ashes are carried from the boilers and dumped into an ash bin on the front of the wharf, from which they are loaded into scows for removal.



No. 230416.

FIFTH AVENUE COALING STATION OF BROOKLYN ELEVATED RAILROAD.